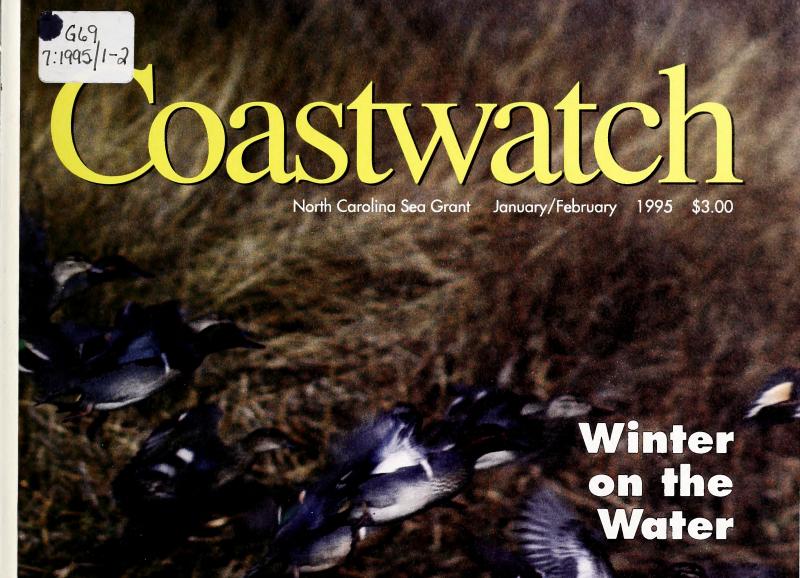


Digitized by the Internet Archive in 2014







INCLUDING

The Wrights' First Flight

P L U S

The Coastal Card Catalog

ALSO

Secrets of Spanish Moss

Coastwatch Staff:

Kathy Hart, Managing Editor
Jeannie Faris and Carla B. Burgess,
Senior Editors and Writers
L. Noble, Designer
Sandra Harris, Circulation Manager

The North Carolina Sea Grant College Program is a federal/state program that promotes the wise use of our coastal and marine resources through research, extension and education. It joined the National Sea Grant College Network in 1970 as an institutional program. Six years later, it was designated a Sea Grant College. Today, N.C. Sea Grant supports several research projects, a 12-member extension program and three communicators. B.J. Copeland is director. The program is funded by the U.S. Department of Commerce's National Oceanic and Atmospheric Administration and the state through the University of North Carolina.

Coastwatch (ISSN 1068-784X) is published bimonthly, six times a year, for \$12 by the North Carolina Sea Grant College Program, Box 8605, N.C. State University, Raleigh, NC 27695-8605. Telephone: 919/515-2454. Fax: 919/515-7095. E-mail: k_hart@ncsu.edu. Second-Class Postage paid at Raleigh, N.C.

POSTMASTER: Send address changes to *Coastwatch*, N.C. Sea Grant, Box 8605, N.C. State University, Raleigh, NC 27695-8605.

Front cover photo of shovelers, green-winged teals and pintails by Michael Halminski.

Inside front cover photo of frosted rope by Scott D. Taylor.

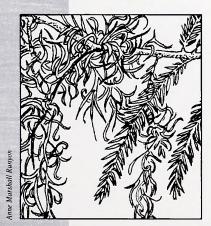
Printed on recycled paper by Highland Press Inc. in Fayetteville, N.C.



Page 2



Page 10



Page 22

N.C. DOCUMENTS CLEARINGHOUSE

N.C. STATE LIBRARY

Features

First in Flight: Extraordinary Feats by Ordinary Men

From the dunes at Kill Devil Hills, two young men from Ohio sent a message to the world Dec. 17, 1903: Man can fly. But the world barely noticed Orville Wright's 12-second burst onto the aviation scene. Or his brother Wilbur's encore flight just shy of 200 feet. The brothers ended the day with a record 852 feet flown in 59 seconds. Today, the hum of air traffic is mere background noise in a high-technology world. But the storytellers at the Wright Brothers National Memorial won't let the public forget those first tentative steps that propelled us skyward. The park rangers at this Outer Banks monument chronicle the lives of these seemingly ordinary brothers in a way that books cannot..... 2

The Cutting Edge of Technology, Then and Now

With persistence and innovation, the Wright brothers made history on an Outer Banks dune field. The Wright Brothers National Memorial marks the site, mingling accounts of past

Winter on the Water

Along the shore, the chilly season ferries in cold winds and the rare raft of snow. Regular contributing photographers Scott D. Taylor of Beaufort and Michael Halminski of Waves share their vision of this cool world in a special winter spread 10

A Place in History: The Outer Banks History Center

If you're in Manteo, don't neglect the Outer Banks History Center. It houses the state's third largest collection of North Caroliniana, including books, periodicals, newspapers, documents, photographs, paintings, audiotapes, place mats and bumper stickers. The center is a history buff's dream come true. 16

Spanish Moss Lends More Than a Graceful Southern Accent

It wouldn't seem fitting for a bald cypress or live oak to be without its characteristic draping of Spanish moss. But this fuzzy, air-growing plant is more than an aesthetically pleasing Southern accessory. It lends comfort to the nests of squirrels and birds, harbors curious microorganisms and is even used to detect

Departments

First in Flight:

Extraordinary Feats by Ordinary Men

By Jeannie Faris

The Wright brothers' story is told on the hour at the visitor center of the Wright Brothers National Memorial in Kill Devil Hills.

Picture the mid-1890s. Handlebar mustaches were in vogue. Gas lights illuminated streets and sidewalks. The automobile had not yet replaced the horse and buggy. Butch Cassidy was robbing trains and banks,

and he was about to hook up with his most notorious partner in crime, Sundance Kid.

Mankind hadn't flown yet. It wasn't even close. But a handful of visionaries shared a dream of powered flight that others considered foolish or fanciful.

Enter Wilbur and Orville Wright. The year was 1896. These inseparable brothers were nothing if not ordinary — a pair of small-time businessmen who repaired and built bicycles in Dayton, Ohio. Orville, 26, was sick with ty-

phoid fever. His 30-year-old brother Wilbur had already given up on life and his dream of attending Yale University's divinity school. A series of operations to repair his jaw, broken in an ice hockey game, had left him slightly disfigured, and the medication had damaged his heart. Worse yet, the whole experience had crippled his self-confidence.

"These brothers have no idea what's coming," says John Gillikin, a park ranger at the Wright Brothers National Memorial. "They're going to fly. It's an awesome accomplishment. These are two ordinary men. That's how they think of themselves."

By the turn of the century, the Wright brothers had joined the heated pursuit of flight among a mostly European, government-subsidized field of competitors. They joined the

race, not so much in the belief that they would actually win, but that perhaps someone else, someplace else, would fly using findings from their trials along North Carolina's Outer Banks.

They did fly, however, and they flew first.

It happened after several bruising years of trials, first in Dayton, then at Kitty Hawk and a dune field known today as Kill Devil Hills. On Dec. 17,

Scott D. Taylor

The Wright Monument stands on the remnant of Big Kill Devil Hill, where the brothers launched their gliders more than 1,000 times.

By the turn of the century, the Wright brothers had joined the heated pursuit of flight among a mostly European, government-subsidized field of competitors.

They joined the race, not so much in the belief that they would actually win, but that perhaps someone else, someplace else, would fly using findings from their trials along North Carolina's Outer Banks.

1903, Orville piloted the first powered flight on the *Flyer*, their newest design. A coin toss three days earlier had given Wilbur the privilege, but he had flown the plane into the ground.

Now it was Orville's turn. At

10:35 a.m., he flew 120 feet in 12 seconds.

Then, at 11:20, Wilbur flew 175 feet in the same amount of time.

It was Orville's turn again. He flew 200 feet in 15 seconds at 11:40 a.m.

And at noon, Wilbur made the last flight of the day, soaring 852 feet in 59 seconds.

Four Outer Banks men and a teenage boy joined the Wright brothers that day to witness the first flights. The

rest of the world barely took notice. The brothers' hometown newspaper reported only that the Wrights would return home from Kill Devil Hills in time for Christmas.

The brothers, however, understood the full significance of their flights.

"This (first) flight lasted only 12 seconds," Orville wrote, "but it was nevertheless the first in the history of the world in which a machine carrying a man had raised itself by power into the air in full flight, had sailed forward

without reduction of speed, and had finally landed at a point as high as that from which it started."

Within two generations, air travel had become routine, the sound barrier had been broken by an aircraft and man had walked on the moon. Today, we celebrate the brothers' ingenuity and persistence through history books and the Wright Brothers National Memorial at Kill Devil Hills. The aviation industry that was born from their discovery is now a significant segment of the U.S. economy.

But at the turn of the century, few shared the Wrights' vision of the possibilities for flight. People laughed at their efforts for four years as they tested the 1899 kite in Dayton and later left their business, usually in the fall

off-season, to test their inventions on the remote Outer Banks. The grueling trip by rail, boat and horse cart would generally take five to seven days, says Darrell Collins, park historian.

The brothers' interest in flight had strange beginnings, true to the tendency throughout history for simple events to unleash life-altering changes.

It all started as Orville lay sick in bed, starving and dehydrating from typhoid fever. Wilbur read to his invalid brother every day; but one day, he forgot to bring a book. So he picked up a newspaper. From it, he read aloud an article about the death of Otto Lilienthal, a German engineer who was killed as he tested a flying machine in Berlin.

The article said that Lilienthal's machine worked, but only for a while, and then it stopped. To a pair of mechanics, this didn't

sound right. A machine either works or it doesn't.

Wilbur's interest in flight was rekindled. As children, he and Orville had been fascinated by a toy flying machine their father had brought home from the world's fair, Collins says. It flew like a helicopter, powered by twisted rubber bands. The brothers learned to reproduce the toy after breaking and repairing it, discovering that the larger they built it the worse it flew.

As an adult seeking direction in his life, Wilbur quietly pondered the puzzle of flight for several years before it ignited a passion in 1899, and he wrote to the Smithsonian Institution for literature. Dismayed that so many great minds had made so little progress, the Wrights launched their work. In 1900, Wilbur wrote a long-

time friend that, "For some years, I have been afflicted with the belief that flight is possible to man." He took the lead in the early stages, but he eventually drew in his younger brother as an equal collaborator. Orville, in the meantime, had recovered from typhoid and returned to building and racing bicycles.

Together, the brothers began experimenting with large kites, but



Park ranger John Gillikin describes early flight in front of a model of the first aircraft piloted by Orville Wright.

Within two generations, air travel had become routine, the sound barrier had been broken by an aircraft and man had walked on the moon.

Today, we celebrate the brothers' ingenuity and persistence through history books and the Wright Brothers National Memorial at Kill Devil Hills.

The aviation industry that was born from their discovery is now a significant segment of the U.S. economy.

they quickly learned that Dayton was not the place to try flying manned gliders. They sought guidance from the U.S. Department of Agriculture Weather Service, which pointed them to an isolated stretch of beach called Kitty Hawk. There, the winds blew strong and the barren sand clearings were soft and flat for landings.

Their first nights at Kitty Hawk were spent in a tent on the beach. Wilbur later wrote in his diary that he had solved the mysterious disappearance of Sir Walter Raleigh's Lost Colony from the Outer Banks. "The mosquitoes ate them all."

That year, 1900, the Wrights began learning to fly gliders, but their results were discouraging. They started by testing the gliders as kites, controlling them from the ground. When they advanced to piloted gliders, the aircraft stayed aloft only a few seconds. The brothers concluded that perhaps their 17-foot glider was too small to fly, so they returned to Ohio to build a larger model.

They tested the new 22-foot model in the spring of 1901 at a dune field now known

as Kill Devil Hills, but their experiments were no more successful. They finally packed up and went home after Wilbur split his head in a glider accident. This, and the realization that they had based their work on other researchers' unreliable data, led Wilbur to conclude that "man would never fly in a thousand years."

At home, however, the interest in flight continued to burn through Wilbur. And for the first time in their lives, the brothers didn't give up. They started over with laboratory tests.

In the fall of 1901, Orville built a wind tunnel that quite possibly saved their lives. It was a long, open-ended rectangular box with a fan in the back that allowed them to test the lifting ability of 200 different wing shapes using the knowledge that wind passing over and under a surface will keep it

aloft. Without this tunnel, the wings would have been tested on actual flights that could have been deadly. Today, elaborate wind tunnels in aeronautical labs continue to advance aviation's horizons.

The brothers were ready to apply their findings in 1902, and their improved 32-foot glider began to shatter records. They soared into 35-mph winds, sustained the longest glides in

history and covered the greatest distances. But because they couldn't control the aircraft, they still weren't flying. They might as well be riding a cannonball, Wilbur said, calling the landings "well-digging."

"They considered the design to be a failure," Gillikin says. "They were breaking records, but they couldn't turn the aircraft."

The brothers knew they had to devise methods and mechanisms for the pilot to direct the course of the flyer and to counteract

the disturbing gusts of wind and other atmospheric conditions. The plane had to be controlled on three axes: climb and ascent, steering to right and left, and sideways balance.

They added control with a vertical rudder in the back, something that had never before appeared in nature. It's not a feature on birds, but on an aircraft it can point the nose and control a turn.

The brothers tested their ruddered glider on Oct. 10, 1902. Wilbur launched from West Hill, gained speed and turned. With this success, they returned to Dayton to build their flying machine.

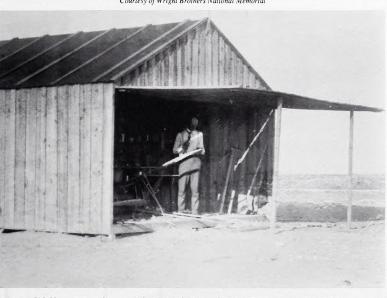
Now all they needed was a lightweight engine and propellers that could lift and propel the combined weight of plane, pilot and motor.

They turned first to the automo-

tive industry. Cars were appearing all over Dayton, but their engines were too heavy for an aircraft. The brothers wrote the manufacturers and asked them to build a lighter model: 8 horse-power and no more than 200 pounds. The manufacturers said no. They were afraid of gambling their reputation on a pair of maverick inventors who built bicycles for a living.

So the brothers turned to Charles

Courtesy of Wright Brothers National Memorial



Wilbur Wright standing in front of the 1902 camp building in Kill Devil Hills.

As an adult seeking direction in his life, Wilbur quietly pondered the puzzle of flight for several years before it ignited a passion in 1899, and he wrote to the Smithsonian Institution for literature. Dismayed that so many great minds had made so little progress, the Wrights launched their work. In 1900, Wilbur wrote a longtime friend that, "For some years, I have been afflicted with the belief that flight is possible to man."

Taylor, the top mechanic at Wright Cycle Co. It was a long shot, since Taylor's only prior experience with car engines was limited to an unsuccessful attempt to repair one in 1901. "I never did get it to work," he said.

Taylor built an engine that barely ran. The first one spit raw gas and oil all over the pilot and operated for only 15 minutes before it exploded. But this flawed design propelled the first successful flight with only four-tenths of a gallon of gasoline.

The Wrights were finally ready to test their machine on Dec. 14, 1903. It

was a beautiful day and seven people showed up. The brothers had friends among the few residents of the area, and they visited regularly at the nearby lifesaving station. But the air was still, and they needed a 15-mph head wind to take off. They decided to try anyway by launching from the top of Big Kill Devil Hill, a 100-foottall dune. Of course, the effort would not count as powered flight because they needed to take off into a wind from level ground and land at a point as high

or higher. But they'd waited too long not to fly that day.

"They'd been laughed at for four years," Gillikin says. "They knew it would fly."

Wilbur won the coin toss and piloted the plane, but the attempted flight ended quickly and badly. As the craft sailed off the dune and pulled sharply into the air, he panicked and overcompensated by flying it into the ground. Repairs to the plane took a couple of days.

On the morning of Dec. 17, the brothers rose early to try again. They were living in a shack with holes in the walls so large that they had to brush sand from their food between bites. The night had been bitterly cold, and there were ice-covered puddles around their camp. The 27-mph wind

was blowing harder than they would have liked since their predicted air speed was only 30 to 35 mph.

Still, they dressed in their business suits and flew a sheet to signal the nearby lifesaving station that they were ready to try again. Five locals arrived to help. One of them was Johnny Moore, a 16-year-old who skipped school that day to witness the first powered flight. Another was John Daniels, a local fisherman who took the famous photograph of the

first takeoff. It shows the airplane flying over the sand and Wilbur watching from alongside, having just released his running hold on the right wing.

This was the only photograph Daniels took in his lifetime, Gillikin says. And he never remembered taking it. The brothers had pointed the camera at a sandy stretch where they thought the plane would take off, and they instructed Daniels to squeeze a ball to drop the shutter when it passed into his view. But when that 605-pound machine lifted into the

air, the fisherman got so excited that he couldn't remember whether he had dropped the shutter. Orville checked the camera; the shutter had dropped, but when? The developed picture told the story. Daniels squeezed the ball exactly when he should have.

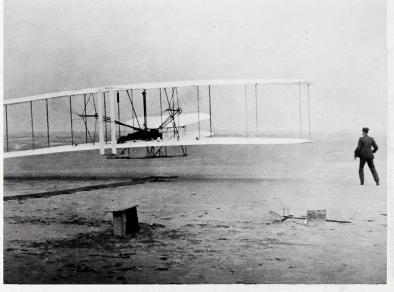
Today, it is the most copied photograph in the world, Gillikin savs.

The other witnesses that day were Willie Dough, Adam Etheridge and William Brinkley. In the 1940s, 30 years after Wilbur's death, Orville would remember these witnesses fondly. He enjoyed taking them to Washington, D.C., where he would wine and dine them, says Warren

Wrenn, supervisory park ranger at the Wright Brothers National Memorial.

After their successful flights, the brothers returned to Dayton to improve on their flying machines, although the world initially took little notice. Years passed before the significance of their achievement was realized. Their 1905 flyer — the first practical airplane — could routinely perform circling flights of up to 38 minutes. But not until 1906 did the Wrights secure a U.S. patent on the

Courtesy of Wright Brothers National Memorial



Orville Wright pilots the first flight at 10:35 a.m. on Dec. 17, 1903, as Wilbur looks on.

"From the time we were little children, my brother Orville and myself lived together, played together, worked together and in fact, thought together. We usually owned all of our toys in common, talked over our thoughts and aspirations so that nearly everything that was done in our lives has been the result of conversations, suggestions and discussions between us."

mechanisms to control the aircraft, which are still used today. The brothers finally unveiled their invention

two years later in the United States and Europe, where kings and queens would push and shove to see it. By 1909, they had opened the era of aviation and began manufacturing their airplanes. They were on their way to wealth and fame.

But Wilbur, the propelling force behind the brothers' early efforts, lived only nine years after piloting two of the world's first flights. He died from typhoid fever in 1912 after a trip to Boston to protect the patent against

> infringement. A month earlier, he had described his relationship with his brother in a letter.

"From the time we were little children, my brother Orville and myself lived together, played together, worked together and in fact, thought together. We usually owned all of our toys in common, talked over our thoughts and aspirations so that nearly everything that was done in our lives has been the result of conversations, suggestions and discussions between us."

After Wilbur's death, Orville sold the Wright Co., which manufactured planes and taught and licensed others to fly them. He died in 1948, just months after U.S. Air Force pilot Chuck Yeager broke the sound barrier, traveling 662 mph at 40,000 feet. Two decades later, astronaut Neil Armstrong carried a piece of the Wright brothers' first airplane in his pocket when he stepped onto the moon.

This is not a story of a machine, Gillikin says, pointing to a full-scale replica of the first powered airplane.

He holds out his arms and asks, "Is this (body) intended to fly?"

"I can pick up half of this airplane with my arm," he says. "With my mind, I can make it fly."

The Cutting Edge of Technology

Then and Now

By Jeannie Faris

of Wright Monument, the five granite boulders that measure off the first gasps of powered flight seem like a toddler's tentative steps across a floor.

By today's standards, they were. But these first flights represented giant leaps in technology and ingenuity in their time.

The Wright **Brothers National** Memorial is an astounding reminder of the brothers'

early struggles to fly as well as the leaps in progress that aviation has made since then. In the span of only a few generations, mankind flew to the moon. That 1969 expedition traveled 413 miles in 59 seconds, the same amount of time it took Wilbur Wright to fly 852 feet on Dec. 17, 1903. Today, space shuttles orbit the earth and land again almost as seamlessly as a commercial flight.

And yet, the early years of flight are still recent enough to live in human memories.

Roy Saunders, formerly of Nags Head, remembers investing his own sweat and muscle in the 1931 construction of the monument honoring the Wrights.

A year later, Orville Wright stood



The dedication of the Wright Monument in 1932. Orville Wright is the third man standing from the left. Wilbur had died 20 years earlier.

on the platform as the 61-foot-tall monument was dedicated.

"I knew it was going to be historic to a certain extent," says Saunders, who recently visited with memorial park rangers. "But I didn't stop to realize how much history was being made."

In the early 1930s, as the possibilities for flight were unfolding, the simple construction of a granite pylon atop a 90-foot hill was a monumental task in remote Kill Devil Hills. It was a far-flung place layered with fine sand but crossed by few roads.

"People go to the monument today and drive all around the blacktop, see the hill, vegetation and the monument," Saunders writes in

The Outer Banks of Dare and Currituck County. "They have no idea how all this was done. It's just beyond anyone's imagination the work that was involved and the changes that have taken place."

A young man at the time, Saunders and a few helpers hauled 74 tons of cement to the site. That was about a fifth of the 400 tons used to build the monument, its

platform and foundation. He remembers that the mix arrived in bags on a boat at the Nags Head steamboat pier. The building contractor asked him to lug them to the south side of Big Kill Devil Hill, the largest sand dune that the Wright brothers launched gliders from. He agreed to the job on the condition that the contractor install a mat road of reeds to prevent his truck from bogging down in the sand.

Saunders' memories ring with nostalgia for a simpler time, a time on the cusp of change. Ironically, on this day, he is in the midst of change again. A planning team from the National Park Service is visiting from Atlanta, Ga., and the four members want to climb to the top of the monument that Saunders helped build.

The team is there to evaluate the park and draft a management plan for its future. All parks within the National Park Service get these checkups on 10- to 20-year cycles, but the Wright Brothers National Memorial has priority status because of the upcoming 100th anniversary of powered flight in 2003.

In particular, the team is looking at whether the park can better tell the

Wright brothers' life story and serve a growing number of visitors. When the visitor center opened in 1960, it served 300,000 people annually. Today, a half-million people pass through its doors, and that number is expected to double within eight years. As a result of these changes in visitation and the advances in passing information to the public, the Park Service team could call for anything from a new building to interactive, computer-driven displays that take advantage of the latest technology in education.

It's only logical, after all. The Wright

brothers were on the cutting edge of technology in their own time, says Richard Sussman, a park planner from the National Park Service's Southeast regional office.

"We're aware that there are a lot of different ways of presenting ideas to people," Sussman says. "These exhibits were from the 1960s, and things have progressed. So we are looking very hard at what's being presented and how it's being presented to the public now."

An inspiration for using interactive computer displays came from Nauticus, the National Maritime Center in Norfolk, Va. Perhaps with

computers, visitors could experiment with building their own planes and learning what works, Sussman says.

Currently, the center tells the Wrights' story in media more typical of the 1960s than the 1990s. Static displays offer glimpses into the brothers' lives, describing their steps toward flight and their other interests, from the newspapers they printed in Dayton, Ohio, to their love for Outer

Four others mark their landings. A pair of camp buildings replicate the brothers' combined living quarters and workshop as well as the hangar where they stored their 1903 flyer.

The facts and artifacts are impressive, but changes in their presentation are probably inevitable. On the other hand, no amount of technology can improve on the lively stories told by park rangers. The



Warren Wrenn, supervisory park ranger at the Wright Brothers National Memorial, and Roy Saunders, a former Nags Head resident who helped build the monument in 1931.

Banks hunting and fishing to Orville's enthusiasm for photography. A cracked, wooden propeller and yellowing wing canvas from the first powered plane are encased on the walls. Also on show are the sewing machine the brothers used to make wing covers for the 1900 glider and a replica of the wind tunnel they used to test the lifting abilities of different wing shapes. Their tools, unspectacular and intended for bicycle repair, nonetheless assembled the first planes.

Outside, a granite boulder marks the point where the Wrights' plane broke free of gravity's pull and flew. hourly talks about the Wrights' lives shouldn't be missed.

In an airy, windowed room commanded by full-scale replicas of the first powered plane and the 1902 glider, the rangers take a seated audience back to the turn of the century and unfold the brothers' lives. School groups and retirees arrive by the busload to hear their stories.

"We have great role models in these men. They lived a clean life and accomplished great feats," says Warren Wrenn, supervisory park ranger at the Wright Brothers National Memorial.

"I'm not sure the people of North

Carolina realize how important this site is to the history of the state or to the world."

The centennial celebration in 2003 may change that by drawing international attention to the 427-acre park. The Park Service planning team aims to upgrade the site by then, but Sussman says it's not yet ready to go public with recommendations. In the spring, the team will pass some of its

where the monument stands, was 100 feet tall when the Wrights used it to launch 1,000 glider flights. It was stabilized with grass after Congress authorized the area as a national park in 1927, and today it stands 90 feet. West Hill, another launching point, is covered with vegetation. Two other 30-foot dunes blew away in a 1912 hurricane — the same year Wilbur died.

..

The First Flight Society celebrates the anniversary of flight with a host of events, including military flyovers.

ideas before local constituents, from town officials to the First Flight Society, an educational organization that commemorates the anniversary of flight. The leading proposal will be shaped by community response during a series of public hearings and input by the Department of Interior, which administers the National Park Service.

One change the Park Service will not pursue is landscape restoration, Sussman says. The Wright brothers experimented among sand dunes and barren stretches of beach. Today, visitors see a very different memorial landscape that has been stabilized with grass and shrubs. Big Kill Devil Hill,

"We cannot restore the landscape to the way it was back in 1903 because it would disappear soon afterward," Sussman says. "So when people look out at all the grass, all the shrubs, (they should realize) that did not exist at the time. But if it wasn't for the existence of that vegetation, the dunes would have moved out and you'd have a fairly flat landscape."

Depending on the extent of proposed changes to the park, outside funding might be needed to carry out the team's ideas. But given the magnitude of the upcoming 100th anniversary, Sussman says, commitments shouldn't be difficult to secure.

"This particular site is looked on by the aviation industry as a shrine," he says. "I think there will be a tremendous amount of interest to help get it ready for the year 2003."

Every year, the anniversary of the Dec. 17 flight is observed by the nonprofit First Flight Society with military flyovers, bicycle races, art contests, banquets and galas. The society is gearing up for an interna-

> tional event on Dec. 17, 2003, Wrenn says. Among other activities, it will reinduct the Wright brothers into its First Flight Shrine for people who have accomplished outstanding firsts in aviation. It has done so in the brothers' honor every year since 1966, and the inductees' portraits hang in the visitor center. In 1994, former President George Bush was inducted as the first rated military pilot to become president of the United States.

> The 2003 event is expected to easily eclipse the 90th anniversary celebration, which was attended by people from as far

away as Iceland. Over the years, the memorial has also hosted aviation dignitaries such as Charles Lindbergh, the first pilot to make a nonstop, solo flight across the Atlantic Ocean, and Amelia Earhart, the first woman to make that flight alone.

The visitor center is open yearround, except Christmas Day, from 9 a.m. to 5 p.m. The price of admission is \$2 per person or \$4 per carload, whichever is cheaper. Admission is free to anyone under 16 or over 62 with a Golden Age Passport. For information, call the visitor center at 919/441-7430.



Winter on the Water

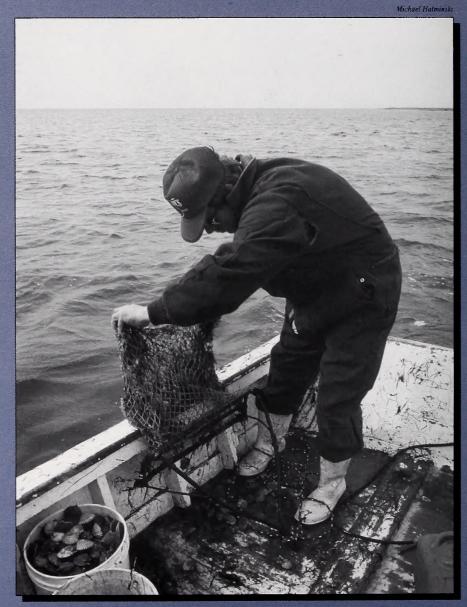






Carolina winters are nothing if not unpredictable. You can never count on a deep freeze or frosting of flakes, particularly on the watery fringes to the east. But let down your guard, and icy blasts of air and sheets of snow are sure to blow in on a Northeast wind.

When winter sacks the shoreline, most coastal folk would rather retreat to a warm blanket with a hot cup of cocoa. But others — by necessity or design — are called to the water in this cold season. Commercial fishermen unfurl their nets in the frigid estuary. Oystermen and clammers tong for shellfish in the icy depths. Hunters get goosebumps to flush a flock of pintails or other winter fowl. Anglers and windsurfers bundle up to brave the chilly gusts. And the faithful? They build snowmen.







































Michael Halminski













Michael Halminski





A PLACE IN HISTORY:

2 2 2 E

By Kathy Hart

It's an unlikely location for one of the largest collections of North Caroliniana in the Old North State.

Everything from valuable first-edition books to glass negatives to bumper stickers is stored in this wood-frame library that sits atop pilings across the harbor from the Manteo waterfront.

Known as the Outer Banks History Center, the library is "superglued," says curator Wynne Dough, to the Elizabeth II Visitor Center on Ice Plant Island.

And there's just a hint of irony in his voice when he mentions that the depository sits over a marsh — not exactly an ideal location for a collection of old books, papers, photographs and paintings that could fall victim to fungal outbreaks caused by dampness.

But the modern conveniences of air-conditioners, heat pumps and humidity controllers usually hold the building's temperature and relative humidity within a range that keeps the center's valuable collections safe and fungus-free.

And, like me, you may be wondering about the building's vulnerability to hurricanes. Dough says the the center is elevated above the 100-year flood level.

All of these precautions, plus the center's elaborate fire-extinguishing system, should make Dough sleep a little easier at night. But the dedicated



Photos from the Aycock Brown Collection

curator always worries about the collection entrusted to his care because he knows how much history is housed within the center's walls. Most notable are several first editions of North Carolina histories, the oldest being John Lawson's *History of Carolina*, originally published in 1714.

Only seven years old, the Outer Banks History Center first opened its doors in 1988. The center was built to receive the personal library and papers of historian and author David Stick, an Outer Banks native. Stick has written or edited 11 books on North Carolina history; two of these, Graveyard of the Atlantic and The Outer Banks of North Carolina, have remained in print more than 30 years.

In writing his books, Stick amassed the state's third largest collection of North Caroliniana, and his personal papers span six decades of journalism and historical research.

In addition to his own work, Stick also donated 324 paintings by his father, the late conservationist and renowned artist Frank Stick.

On the basis of these collections, the N.C. Division of Archives built the Outer Banks History Center. But that was just the beginning. Since then, Dough, the center's first and only curator, has been adding to the collection as fast as he can beg or buy new holdings.

In September 1988, the Dare County Tourist Bureau donated more than 17,000 black-and-white photographs taken by Aycock Brown, a tireless promoter of the Outer Banks and a prolific photographer. Also deposited within the stacks are collections from the Elizabeth II Historic Site, the Cape Hatteras National Seashore and the Cape Lookout National Seashore.

"We have books and periodicals like the state library and manuscripts like state archives," Dough says. "But our collection is unique; there's nothing quite like it in North Carolina."

The Outer Banks History Center

3 3 3 3 B

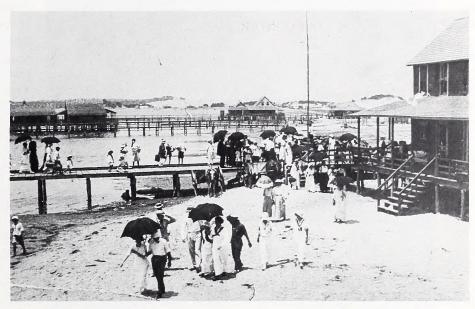
Books. periodicals, newspapers, documents, reports, calendars, maps, paintings, engravings, audiotapes, microfiche, place mats, bumper stickers, postcards and campaign literature all have a place in the center's growing collection, Dough says.

"If it's flat, we got it," says the dry-witted curator.

About the only thing the Outer Banks History Center doesn't collect is artifacts, Dough says. There's an unwritten agreement that the center will not accept these historical tokens so that they can be concentrated in museums — N.C. Museum of History, N.C. Maritime Museum, Museum of the Albemarle and Cape Fear Museum.

Artifacts aside, patrons willing to spend time at the center can get a heapin' helpin' of history. They can read through the writings of North Carolina's first historians — Thomas Harriot, John Lawson and John White; listen to a Carteret County native weave a story of days gone by; or flip through Brown's photographs for a snapshot history of early development and tourism along the Outer Banks.

But Dough cautions that you shouldn't let the name Outer Banks History Center fool you. The center's focus goes far beyond the ribbons of



sand that elbow into the Atlantic along the Tar Heel coast.

Historically speaking, the center's collection spans the state from the Blue Ridge Mountains to the Atlantic Ocean, with a special emphasis on coastal events of days past. But visitors can also feed their hunger for history of Tidewater Virginia, the English Tudor and Stuart periods, and U.S. naval and maritime history.

History isn't the center's only bent. Dough has also amassed a collection of marine science information. In fact, many N.C. Sea Grant publishings, from *Coastwatch* to scientific reports and proceedings, are shelved in this coastal depository.

And among the hordes of nonfiction, a few jewels of fiction and poetry glitter in the center's collection. Although novels are fictitious, their settings or story lines often reveal valuable historical and cultural information.

"I refer people to the center all the time for information about fish, boats or generalities about the coast," says Sea Grant specialist Rich Novak. "And always, they come back satisfied customers."

The history center's gallery and reading room attract a variety of patrons. Some come to see the visual offerings —

photographs, paintings and drawings — that rotate through the center's 1,000-square-foot gallery. But most are interested in the library's reading material, which must be viewed on the premises. The center is not a lending library.

"We get a lot of journalists doing research; we see novelists and screen-writers and lots of folks doing genealogical searches — not all of whom are trying to prove they're related to Virginia Dare," Dough says with a laugh.

A researcher visited from the University of Tokyo, and written queries have come from as far as Denmark's Faeroe Islands. As for famous visitors, historical novelist David Payne, author of *Early from the Dance*, has delved into the center's collection, as have writers Rod Farb, Tom Crouch and Gary Gentile.

The staffs of television's "Unsolved Mysteries" and Time-Life Books have conducted research there. Actor Andy Griffith has been videotaped at the center twice — for ABC's "20/20" and for public television's "N.C. People."

Dough notes that a few other famous and not-so-famous novelists should have darkened his door or that of another library before committing words to paper. They could have avoided mistakes that have planted misconceptions about the Outer Banks in the minds of the public.

Take Tom Clancy, for example. In his novel The Hunt for Red Octo-

ber, the captured submarine Red October is secreted into U.S. waters through Oregon Inlet.

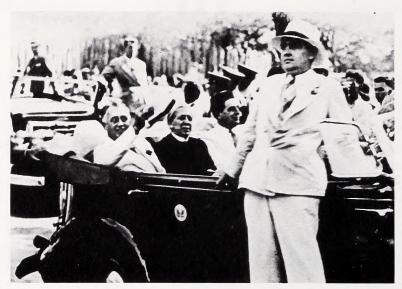
"You can barely get a rowboat, much less a submarine, through Oregon Inlet," Dough says.

And Anne Rivers Siddons does a poor job of staying true to the area she uses to title her novel Outer Banks.

For serious writers of scholarly works and historical novels, the Outer Banks History Center is an undiscovered gem in the state's trinity of historical collections. It's not as well-known as the State Library in Raleigh or the North Carolina Collection at the University of North Carolina at Chapel Hill, but the size and historical worth of its collection make it a library deserving of notice.

Dough constantly works to increase the center's prominence and the size of its collection. The center accepts gifts of books, recordings, manuscripts, photographs, maps and other items in its field of interest. Call Dough at 919/ 473-2655 if you have an item that you think the center may have an interest in collecting.

The Outer Banks History Center Associates also underwrite some acquisitions and programs and provide volunteer help.



To improve accessibility to the collection, the center will soon have a rest stop on the information highway. Then patrons will be able to search the on-line holdings without traveling to Manteo.

But until then, here is a listing and description of the center's major collections.

The David Stick Collection comprises more than 25,000 books and pamphlets, most of them pertaining to the history and culture of the North Carolina coast, general and regional maritime history or marine science. The collection includes the following noteworthy entries:

- more than 4,500 wreck reports, rosters and other documents from local Lifesaving Service and U.S. Coast Guard stations from the period 1883-1933;
- more than 3,000 black-and-white photographs;
- more than 1,300 newspapers and periodicals; and
- more than 600 original maps and charts.

In addition, the collection contains Stick's correspondence, research notes and files from numerous agencies. organizations and projects on which he served.

The Frank Stick Collection includes all of the paintings from AnArtist's Catch, newly discovered works and printed illustrations from books, calendars and periodicals.

For the Aycock **Brown Tourist Bureau** Collection, picture this: 17,000 black-and-white photographs, 3,000 negatives and 20 cubic feet of letters and clippings. This collection

provides a picture-perfect history of the Outer Banks as seen through the eyes of publicist Aycock Brown. During his 60-year career, the tireless photographer snapped more than 100,000 photographs of the Outer Banks. Although their composition isn't particularly artistic, they offer a priceless pictorial history of the area.

The Elizabeth II State Historic Site Collection includes a variety of books, pamphlets and periodicals about the Raleigh colonies, naval and maritime history, and Tudor and Stuart England.

The Cape Hatteras National Seashore Library was deposited at the Outer Banks History Center in 1989 and includes more than 1,500 books and various manuscripts and periodicals. Much of this collection is scientific in focus.

For an earful of firsthand history, listen to the Cape Lookout National Seashore Oral History collection, which includes 72 oral histories recorded in Carteret County on 116 audiocassettes. The collection is complemented by 48 oral histories of Outer Banks natives recorded and donated by William Harris, superintendent of the Cape Lookout National Seashore.

Recommended Readings

By the Outer Banks History Center staff

(Editor's Note: I asked Wynne Dough, the curator of the Outer Banks History Center, for a top-10 list of books people should read to have a better understanding of the history, culture and natural history of the North Carolina coast. He and his staff collectively arrived at the following list.)

We were reluctant to list the 10 or 20 or 100 best books about the North Carolina coast. Some superlatives are as boring as household dust; some are the best in one area but not in others. Many fascinating books are badly flawed. We chose instead to list 24 books that we've found integral to our tentative understanding of the region.

Ranking them
seemed pointless — a
hammer is a better tool, a pie is better
dessert — so we've put them in order
of their primary authors' surnames.

1. John Alexander and James Lazell. Ribbon of Sand: The Amazing Convergence of the Ocean and the Outer Banks. Algonquin, 1992.

Some of the most distinguished regional nature writing published in



the last decade, as are 3 and 13. Though radically different in form, content and tone, all three are eminently readable.

2. Nancy Davis and Kathy Hart. *Coastal Carolina Cooking*. UNC Press, 1986.

Nearly every recipe — roasted swan, clam chowder with cornmeal

dumplings, fig pudding and yaupon tea — has compelling significance or charm. Unlike innumerable cookbooks produced by churches and civic organizations, this is mercifully short on commonplace dishes. The authors' avoidance of meat loaf almost atones for their omission of stewed loon.

3. Jan De Blieu. *Hatteras Journal*. Fulcrum, 1987.

4. Gary S. Dunbar.
Historical Geography
of the North Carolina
Outer Banks. Louisiana
State University Studies. Coastal Studies
Series 3. LSU Press,
1958.

Although Dunbar worked the academic side of the street and David Stick the popular, the two shared

notes and insights. Dunbar's hard-tofind Historical Geography and Stick's Outer Banks (21), which was published the same year and is still in print, make up many readers' sum of knowledge about the Outer Banks.

5. Carl Goerch. *Ocracoke*. John F. Blair, 1956.



A collection of short pieces by the irrepressible founder, publisher and editor of The State.

b. Paul Green. The Lost Colony: An Outdoor Play in Two Acts (with Music, Pantomime and Dance). UNC Press, 1937.

This play is not only the first and longest-lived outdoor drama in the United States, but also the source of what multitudes know or think they know about the Raleigh colonies. Later editions have different subtitles and more subtle dissimilarities.

Rod Gragg. Confederate Goliath: The Battle of Fort Fisher. Harper Collins, 1991.

8. Thomas Harriot. A Briefe and True Report of the New Found Land of Virginia. Dover, 1972.

Harriot taught Sir Walter Raleigh navigation, discovered sunspots independently of Galileo, invented the symbols < and >, and wrote the first scientific report on the resources and people of eastern North Carolina. Quinn's Roanoke Voyages (see 16) also contains the text. But this facsimile of the 1590 edition warrants separate mention because it includes engravings by Theodor De Bry and others based on John White's watercolors.

9. Homer Hickam Jr. Torpedo Junction: U-Boat War off America's East Coast, 1942. Naval Institute Press. 1989.

This book covers the Eastern Seaboard, but it contains a great deal relevant to North Carolina.

10. Hilda Jaffe. The Speech of the Central Coast of North Carolina: The Carteret County Version of the Banks

"Brogue." Publication of the American Dialect Society 60. University of Alabama Press, 1973.

Despite its recent publication, this is an early inquiry into a dialect often labeled as Elizabethan, Cockney, Anglo-Saxon High Tider and so on in the popular press.

11. Archie Johnson and Bud Coppedge. Gun Clubs and Decoys of Back Bay and Currituck Sound. Pictorial Heritage Publishing Company, 1991.

A copiously illustrated introduction to an engrossing subject.

12. Fred C. Kelly. *Miracle at Kitty* Hawk: The Letters of Wilbur and Orville Wright. New York: Farrar, Straus and Young, 1951.

This book deals with more than the Wrights' work at Kitty Hawk, but it deserves inclusion nonetheless.

- **13.** Janet Lembke. *River Time: The Frontier on the Lower Neuse*. Lyons and Burford, 1989.
- **14.** Ben Dixon MacNeill. *The Hatterasman*. John F. Blair, 1958.

Despite his background in journalism, MacNeill seemed to work best in the disputed territory between fiction and nonfiction. Although he seldom let a mere fact stand in the way of a good yarn, The Hatterasman won the Mayflower Award, usually reserved for works of nonfiction.

15. Orrin H. Pilkey Jr., William J. Neal and Orrin H. Pilkey Sr. *From Currituck to Calabash: Living with North Carolina's Barrier Islands.* N.C. Science and Technology Research Center, 1978.

A wake-up call that many public officials and private citizens have yet to heed and a precursor to The Beaches are Moving (Doubleday, 1979), which treats the entire coastal zone of the United States.

16. David B. Quinn, ed. *The Roanoke Voyages*, *1584-1590*. For the Hakluyt Society, 1955.

This two-volume documentary history of the Raleigh colonies is thicker and harder to acquire than a good Sumerian dictionary, but is indispensable to the serious student. Elevated diction, dense annotation and vast tracts of unaltered 16th-century spelling make for poor recreational reading. But The Roanoke Voyages nearly exhausts contemporary English and Spanish sources of information about the Raleigh colonies, including many absent from Hakluyt's Principal Navigations. Its appendices on the

Carolina Algonkian language and other topics are still helpful after four decades. Virginia Voyages from Hakluyt (Oxford University Press, 1973) is in essence an abridgment, which the N.C. Division of Archives and History reissued in 1982 as The First Colonists.

17. William L. Saunders, ed. The Colonial Records of North Carolina. Vol. 1, 1622-1712. P.M. Hale, 1886.

This book includes a 1653 visit to the ruined Roanoke settlement, the Carolina Charters, the settlement of the Cape Fear by Barbadians and the Tuscaroran Wars. There's hardly an irrelevant entry, because the earliest history of North Carolina is necessarily coastal history.

18. Gregory Seaworthy [George Higby Throop]. *Nag's Head: Or, Two Months among "the Bankers."* A. Hart, 1850.

The Albemarle rich who summered in antebellum Nags Head to escape the malaria, yellow fever and tedium of the mainland were unusual people, at once cosmopolitan and provincial. They brought their livestock, servants, ministers, relatives and neighbors. They had necessities and luxuries shipped in and lived separately from the local people. When they returned to the mainland, they took everything but their empty cottages. Nag's Head, the second novel set on the Outer Banks, treats the lives of these mainlanders and their view of the area. Richard Walser's facsimile edition, Nag's Head and Bertie, Two Novels by George Higby Throop (Heritage House, 1958), albeit long out of print, is much more common than the original.

- **19.** Judith M. Spitsbergen. Seacoast Life: An Ecological Guide to Natural Seashore Communities in North Carolina. UNC Press for the N.C. State Museum of Natural History, 1980.
- **20.** James Sprunt. *Chronicles of the Cape Fear River*, 1660-1916, 2nd ed. Edwards and Broughton, 1914, 1916.

This expansive hodgepodge comprises, among other things, bits of verse, letters from Daniel Webster and Jefferson Davis, and a summary of improvements to navigation.

21. David Stick. *The Outer Banks of North Carolina*, 1584-1958. UNC Press, 1958.

A rare book — a local history sound enough to serve as a reference work and engaging enough to maintain the interest of the general reader.

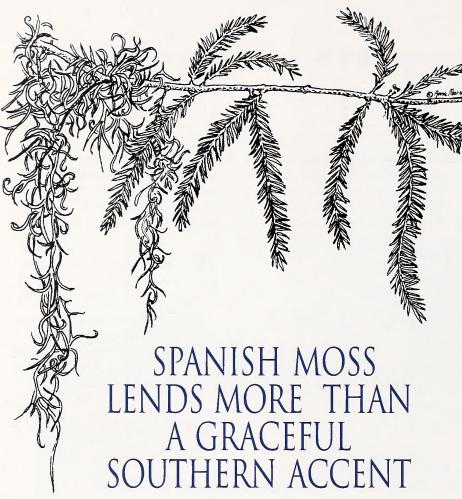
22. David Stick. *Graveyard of the Atlantic*. UNC Press, 1952.

As painstakingly researched as this author's history of the Outer Banks, this book offers stronger narrative threads.

23. Charles Harry Whedbee. *Legends* of the Outer Banks and Tar Heel Tidewater. John F. Blair, 1966.

This was Whedbee's first published collection of tales — most of them based on folklore, a few entirely synthetic. It's the quintessential beach book: entertaining, but not oppressively educational.

24. Tony P. Wrenn. Wilmington, North Carolina: An Architectural and Historical Portrait. University Press of Virginia, 1984.



By Carla Burgess

Few natural sights are more characteristic of our Coastal Plain than Spanish moss, the essential accessory of any respectable Southern tree. It wouldn't seem fitting for a bald cypress or live oak to be unadorned by its silvery festoons. Although it makes a home high in tree boughs, Spanish moss is not a parasite. That it strangles and kills hardwoods is a myth. Even the name is misleading, for it is neither Spanish nor moss.

The plant was christened by Kiawah Indians, who noticed that the long, flowing beards of Spanish settlers rivaled the mosslike tresses that draped tree branches. That's the story nature train driver Angela Liles tells visitors to Magnolia Plantation and Gardens in Charleston, S.C.

A member of the Tillandsia family, Spanish moss is related to the pineapple. And like bromeliads, it is an epiphyte or aerial plant, having no structural relationship to the surface on

which it rests. Being rootless, Spanish moss can even thrive on telephone poles or other supportive objects.

The slender, elongated stems and leaves are covered with scales that resemble gray hairs. These scales help the plant drink in dew and rainwater. Dust provides a steady diet of minerals.

Both herbaceous and perennial, Spanish moss flowers from April to July in coastal North Carolina. Its pointed, sticky seeds are blown through the air and often bind in cracks and crevices of bare or dying branches, where the plant can flourish. This, coupled with the fact that heavy, saturated moss can take a toll on old, weak limbs, often causes the mistaken belief that Spanish moss kills trees. Probably its only true nuisance is in pecan groves, where the plant can cover the desired fruit.

In the United States, the plant lives along the coast from southern

Virginia to Texas. Found primarily in highly humid areas, the plant can swell to nearly 75 percent water, turning rubbery green. In North Carolina, Spanish moss grows in most of the coastal counties, generally 60 to 80 miles inland, says Alan Johnson, a curator at the N.C. Botanical Garden.

Through the years, humans and animals have been creative in their uses of Spanish moss. Henry Ford stuffed the seats of his first Model T with it, writes naturalist Todd Ballantine in Tideland Treasures. Similarly, early manufacturers used it in bedding and furniture. The ginning and milling of Spanish moss once supported a lucrative industry in parts of the Southeast. Its homey attributes aren't lost on the animal kingdom either: Squirrels and birds pad their nests with it.

Herbalists reportedly made a tea from Spanish moss to relieve rheumatism and abscesses. Archaeological excavations in Louisiana revealed its use as a binder in early Native American pottery.

Its lore and legend are vast, says an N.C. State University zoologist who studies the microscopic animals inhabiting this furry-looking plant.

Harold Heatwole has traveled the coast from Virginia to Texas collecting Spanish moss. Meanwhile, he's amassed a wealth of folklore to accompany his specimens.

"In some places, people will put a little wad of it in their shoe, and they believe that keeps their blood pressure from getting too high," says Heatwole, recalling a tidbit he picked up in Hog Hammock, Ga. Another reported use of the plant was as an absorbent filling for homemade diapers, he says.

Equally fascinating is what

Heatwole sees through his microscope as he probes the plant — tiny animals with four pairs of stout legs, also known as water bears or tardigrades. There are rotifers, protozoans and nematode worms too. These are all nearly microscopic animals that can exist in suspended animation for

decades when dried out.

"They are similar to species found in soil that is subject to drying out," he says. "They're basically soil animals living up in trees."

As morning dew or rain moistens Spanish moss, the critters become active. But when the moss is parched, the microscopic community of animals goes dormant.

"They can stand high and low temperatures, they're unaffected by chemicals, they even quit respiring and metabolizing," says Heatwole.

Spanish moss, which is among the most widespread plants in the world, is one of nearly 2,000 species of Tillandsia. Its

relatives are equally intriguing from a zoological point of view. In South America, the leaf bases of some species form a watertight container that supports aerial ponds in the forest canopy, says Ed McWilliams, a horticulturist at Texas A&M University. Small crabs have even been found dwelling in

bromeliads in these tree habitats. he says.

Aside from a fascinating community of inhabitants, Spanish moss has scientific significance as an indicator of air pollution.

"Spanish moss, like lichens, obtains all it needs from the air and there-

McWilliams has used propagated plants to sample air in a 24,000square-mile region of northeast Texas. Because Spanish moss doesn't use soil, elements found inside it can be traced to the atmosphere. The samples are placed high on plastic poles away from obvious local pollution sources,

such as highways, he says.

Unlike mechanical air samplers, which can cost up to \$5,000 apiece, Spanish moss is cost-effective. can be used in remote areas where electricity is unavailable, and requires no security or maintenance. McWilliams has used his "poor man's air sampler" to test for 36 elements.

"One of the things we see when we do this is a drop-off in sodium in the atmosphere as we move farther north," he says. "So we get a natural picture of a broad regional atmospheric chemistry."

As he studies changes in the atmosphere,

McWilliams will also look for how industrial pollutants are affecting local communities of this native plant. Most recently, he has used Spanish moss which many Texans call by its Spanish name galitos — to get a picture of air pollution in south Texas along the Rio Grande Valley.



fore accumulates gaseous and particulate metal pollutants," says botanist David Richardson, dean of science at St. Mary's University in Nova Scotia and author of Pollution Monitoring with Lichens. "For this reason, like lichens, Spanish moss has been used for pollution monitoring."

Fishing Show and Seminar Around the Bend

New initiatives are on the horizon for North Carolina's fishery resources. In their wake, questions abound.

What's behind the two-year moratorium on the sale of commercial fishing licenses? What kind of projects will the state's new fishery resource grant program fund? What will the efforts of the Oyster Blue Ribbon Advisory Council mean for replenishment of these shellfish in North Carolina?

These topics — along with the future of bycatch reduction devices in the shrimp fleet — will be the focus of a fisheries seminar to coincide with the 15th Annual N.C. Commercial Fishing Show and Festival March 11-12 in Morehead City.

The free seminar, sponsored by N.C. Sea Grant, is scheduled for 1 p.m. to 4 p.m. on March 11 at the Crystal Coast Civic Center. Featured speakers are B.J. Copeland, director of N.C. Sea Grant; Dirk Frankenberg, chair of the Oyster Blue Ribbon Advisory Council; and Sean McKenna of the N.C. Division of Marine Fisheries.

The civic center is also the site of the two-day show and festival sponsored by the N.C. Fisheries Association. It features commercial fishing equipment, demonstrations of boatbuilding and net-making and a U.S. Coast Guard air-to-sea rescue simulation in Bogue Sound. Admission to the show is \$2 (children under 12 admitted free); seafood and concessions will be available throughout. Show hours are 9 a.m. to 6 p.m. Saturday and 10 a.m. to 4 p.m. Sunday.

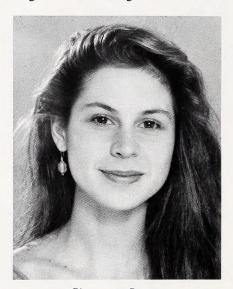
For more information about the fisheries seminar, call N.C. Sea Grant at 919/515-2454. For more information about the fishing show, call Tina Beacham, N.C. Fisheries Association, 919/633-2288.

Knauss Fellow Named

Cinnamon Rogers, a law student at the University of North Carolina at Chapel Hill, was recently named a Dean John A. Knauss Policy Fellow by the National Sea Grant College Program.

Rogers, who was submitted as a candidate for the fellows program by N.C. Sea Grant, is co-president of the Environmental Law Project at the UNC-CH Law School. The project tackles environmental justice projects.

During the summer of 1994, Rogers served as a legal intern for the



Cinnamon Rogers

environmental division of the N.C. Attorney General's office. She participated in cases involving the N.C. Division of Marine Fisheries and N.C. Division of Coastal Management, researching such issues as public trust ownership of submerged lands, commercial fishing regulations and commercial fishing license revocations.

A native of Chapel Hill, Rogers received her undergraduate degree in political science from the University of Michigan at Ann Arbor.

The Knauss program matches highly qualified graduate students with hosts in Congress, the executive branch or appropriate associations/

institutions for a one-year paid fellowship in Washington, D.C. Rogers plans to work in the legislative branch.

Coastwatch Honored

Coastwatch and its staff won a 1994 APEX Award for Publication Excellence in the sixth annual competition sponsored by the editors of Communications Concepts, publishers of Communications

Manager and Writing Concepts.

The Sea Grant magazine won an honor in the category of nonprofit external magazines/journals.

Hurray!

Fishing Forum 1995 Looks at a Critical Year for Fisheries

Fisheries issues are at a cross-roads in North Carolina and across the nation. The 1995 N.C. Marine Recreational Fishing Forum, scheduled March 4 in Raleigh, will evaluate some of the problems plaguing fisheries and the management options for resolving them.

"There are some major problems in fisheries," says Jim Murray, conference organizer and director of the Marine Advisory Service for N.C. Sea Grant. "They've been in the news a lot. And there are going to be some important decisions to be made, all suggesting that there could be major changes in the next year or two."

Among the upcoming issues in North Carolina are the possible passage of a saltwater license to fish and changes in management during the moratorium on commercial licenses. North Carolina also has a blue ribbon council studying the oyster industry and an opening for director of the Division of Marine Fisheries.

Conference organizers hope that the discussion among panelists and attendees will help influence the direction of fisheries issues in the state. The agenda includes presentations on:

- rebuilding marine fisheries through fundamental changes in management programs;
- new directions for the Division of Marine Fisheries;
- ways the Atlantic States Marine Fisheries Commission affects recreational fishermen in North Carolina:
- new initiatives of the Marine Fisheries Commission;
- the recreational saltwater fishing license;
- implementation plans for important recreational fisheries — red drum, bluefish and summer flounder;
- an angler-based management system in Texas;
- water quality and habitat protection — basic ingredients in rebuilding marine fisheries;
- ways water quality affects fish populations;
- estuarine stocking programs in Texas and possibilities for North Carolina;
- ways to identify tunas, flounders and groupers;
- saltwater fly-fishing;
- tarpon fishing in the state;
- a fishing club's effort to tag speckled trout;
- drum tagging and migrations;
- and ways recreational fishermen can help with federal and state fisheries enforcement.

The event will be held from 8 a.m. to 6 p.m. at the Jane S. McKimmon Center at N.C. State University. Registration is \$20 before Feb. 22 and \$25 afterward. For more information, call the Sea Grant office at 919/515-2454, or write N.C. Sea Grant, Box 8605, NCSU, Raleigh, NC 27695-8605.

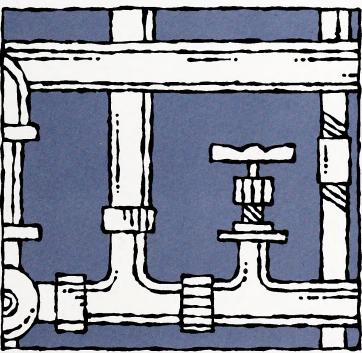
The proceedings of the 1994 fishing forum are now available for

\$3.50. The theme of last year's meeting was "Finding Common Ground." Ask for publication number UNC-SG-94-08.

Coastal Septic Solutions

When it comes to installing a conventional septic system at the coast, there are two problems: porous sandy soils and high water tables. Sandy soil often doesn't adequately purify sewage effluent before it reaches the water table. The result can be contamination of groundwater and nearby creeks and estuaries.

But N.C. Sea Grant researchers



have developed an alternative septic system that has been successful in coastal soils. Called low-pressure pipe waste treatment, this system features three design improvements.

Effluent distribution lines are placed shallowly in the soil to increase the distance from the water table. Effluent is pumped to the distribution lines periodically instead of continually to allow the soil more time to purify. And effluent is distributed evenly throughout a large septic field to prevent overloading in a small area.

Sea Grant has several helpful

publications on the subject. *Under-standing Septic Systems* explains how septic tanks work and describes alternative systems. It is free; ask for publication number UNC-SG-BP-83-1.

Design and Installation of Low-Pressure Pipe Waste Treatment Systems tells how to design, install and maintain a residential lowpressure pipe system. This 32-page illustrated manual is \$2.50; ask for publication number UNC-SG-82-03.

Pressure-Dosed Septic Systems: Electrical Components and Maintenance discusses how to select, use and maintain the controls and accessories

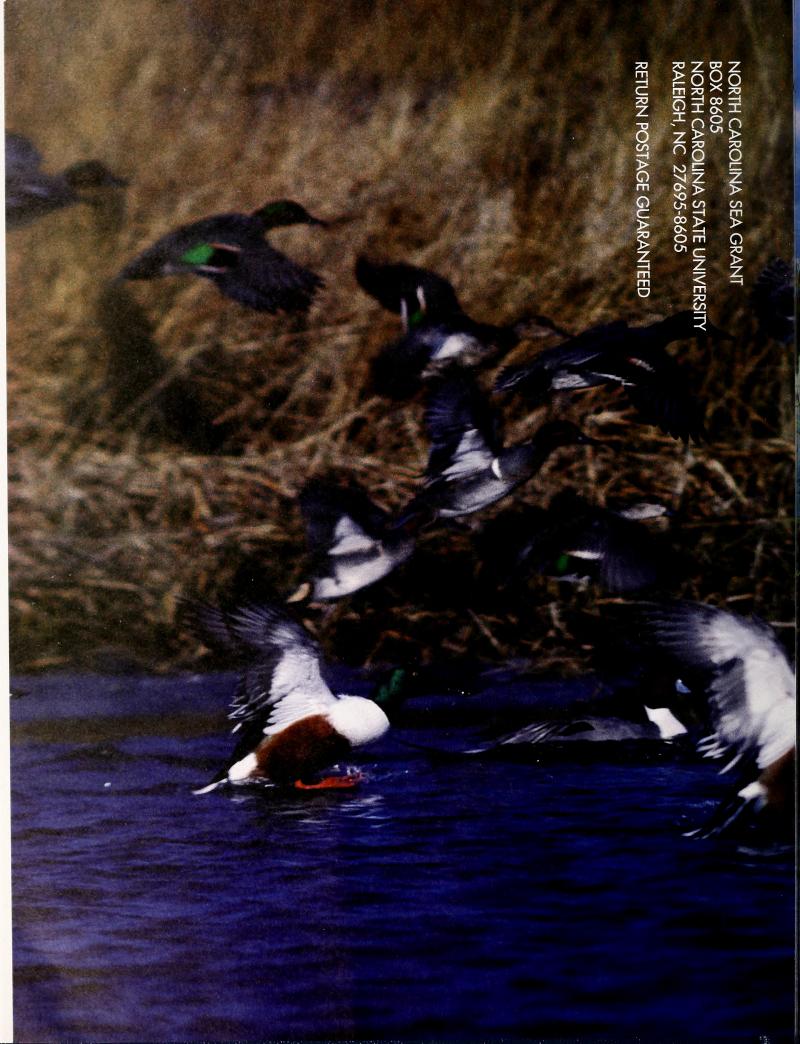
needed for pressure-dosed septic systems. This 26-page booklet is available for \$3; ask for publication number UNC-SG-85-06.

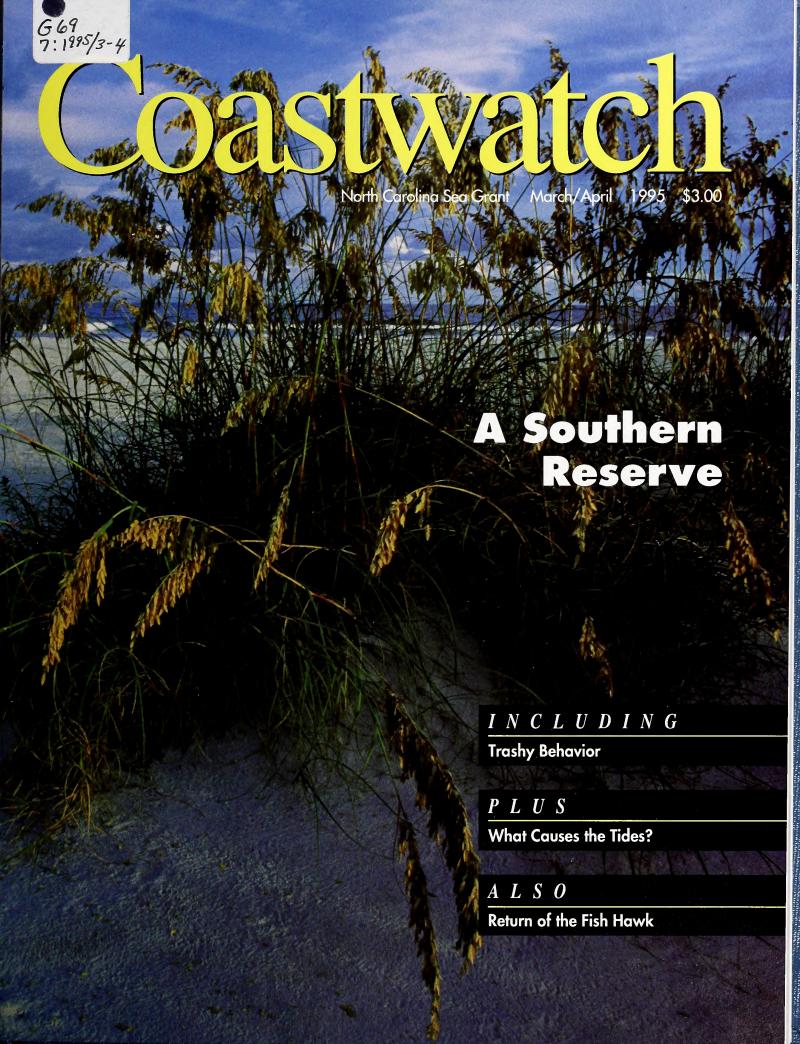
Design and Installation of Mound Systems for Waste Treatment covers design and installation of small mound systems suitable for homes and small businesses. It is \$2.50; ask for publication number UNC-SG-82-04.

If your home is already serviced by a septic system, follow these tips to keep it — and the surrounding environment — in proper working order.

- Know the location of all components of your septic system and keep heavy vehicles away.
- Don't plant trees or shrubs near the drain lines because roots can clog them.
- Distribute your laundry chores throughout the week to avoid overloading the system on any given day.
- Don't use your toilet as a trash can.
- Have your septic tank inspected every year and pumped out every three to five years to remove solids.

For more information, write Sea Grant, Box 8605, NCSU, Raleigh, NC 27695-8605. Or call 919/515-2454.





Coastwatch Staff:

Kathy Hart, Managing Editor Jeannie Faris and Carla B. Burgess, Senior Editors Larisa Tatge and Rachel Wharton, Staff Writers L. Noble, Designer Sandra Harris, Circulation Manager

The North Carolina Sea Grant College Program is a federal/state program that promotes the wise use of our coastal and marine resources through research, extension and education. It joined the National Sea Grant College Network in 1970 as an institutional program. Six years later, it was designated a Sea Grant College. Today, N.C. Sea Grant supports several research projects, a 12-member extension program and a communications staff. B.J. Copeland is director. The program is funded by the U.S. Department of Commerce's National Oceanic and Atmospheric Administration and the state through the University of North Carolina.

Coastwatch (ISSN 1068-784X) is published bimonthly, six times a year, for \$12 by the North Carolina Sea Grant College Program, Box 8605, N.C. State University, Raleigh, NC 27695-8605. Telephone: 919/515-2454. Fax: 919/515-7095. E-mail: k_hart@ncsu.edu. Second-Class Postage paid at Raleigh, N.C.

POSTMASTER: Send address changes to *Coastwatch*, N.C. Sea Grant, Box 8605, N.C. State University, Raleigh, NC 27695-8605.

Front cover photo of Masonboro Island by Walker Golder.

Inside front cover photo of brown pelicans by Walker Golder.

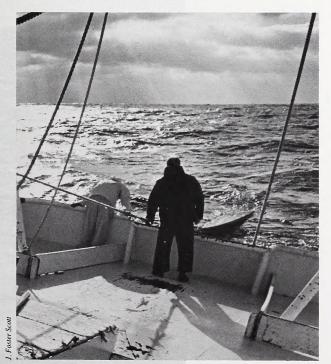
Printed on recycled paper by Highland Press Inc. in Fayetteville, N.C.





Page 2





Page 22

Features

Masonboro Island: An Undisturbed Legacy

A stone's throw from the urban stretches of Wrightsville and Carolina beaches, Masonboro Island has remained in untouched splendor for years. When landowners considered development in 1983, the Society for Masonboro Island and the state Division of Coastal Management stepped in to preserve Masonboro Island as part of the N.C. National Estuarine Research Reserve system. Staff writer Rachel Wharton explores the past, present and future

Trashing Bad Habits:

A First-Person Account of Eco-Sins and Redemption

Staff writer Jeannie Faris is of a generation raised on convenience packaging — people who can toss trash into the can without a twinge of conscience. But this throwaway lifestyle is coming under fire by a national campaign that urges consumers to reduce their wastes and reuse what they can. Faris describes turning the corner, learning to precycle, recycle and compost as alternatives to sending garbage to the landfill and incinerator. 10

Earth Day: Roots of the Green Movement

Earth Day is poised to celebrate its 25th anniversary on April

The Choreography of the Tides

Twice a day in North Carolina, the ocean's edge takes a bow at the dunes and retreats again. What's behind this mysterious cycle of the tides? The moon, the sun, the Earth and a lot of intricate movement......18

The Osprey: A Bird's-Eye View

One of North Carolina's most impressive raptors — the osprey — will appear soon at area lakes, streams and beaches. Learn more about the famous "fish hawk" and the areas where it

Taking the Plunge:

Sea Grant Studies the State's Commercial Fishing Industry

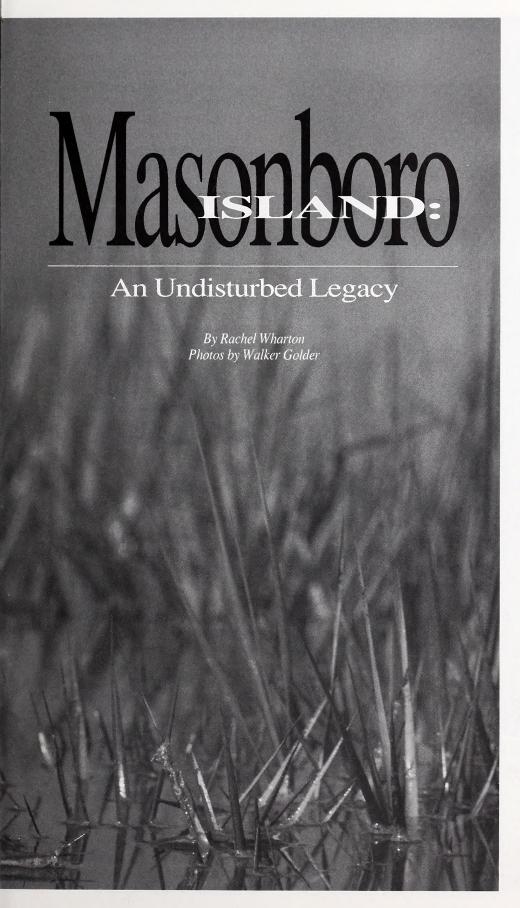
Sea Grant has embarked on a landmark project to examine North Carolina's fishing industry. Hanging in the balance is the state's seafood industry and the fresh fish that ends up on your

Departments

Aft Deck						2		я
All Deck						4	260	à



Snowy egret



-rockette W. Hewlett married into the Masonboro magic.

When Crockette moved with her husband Addison to his native town along Masonboro Sound in 1951, she was captured with the land — its great gusts, its salty spray, the view of nearby Masonboro Island. Crockette was so captured, in fact, she wanted to write about her new home.

Twenty years later, Crockette set out to record the history of the community of Masonboro in Between the Creeks: A History of Masonboro Sound from 1735 to 1970.

Addison Hewlett, about whose native soil and people this history was written, was from a family that lived along Masonboro Sound for decades. The Hewletts and other clans who lived there in the 18th and 19th centuries were devoted to the coastal marshes and the distinct beauty that life by the water afforded. They lived in the midst of delicate grasses, crusty oaks, soaring terns - across the water from the untouched wilderness of Masonboro Island.

These families have marked the Masonboro shores and the waters nearby as their homeland with gravestones, street signs and creek names. Hewletts Creek, which empties into Masonboro Sound, was named after Addison Hewlett's family. The Hewletts even owned part of Masonboro Island.

Today, these families' legal ties to the island have been cut. The state owns almost all of Masonboro Island, which is now part of the N.C. National Estuarine Research Reserve.

Continued

As an estuarine reserve, the island fulfills two purposes. It provides undeveloped sites for both exploration by naturalists and for research by scientists. And it acts as a standard — a standard by which we can measure how development is affecting other barrier islands.

Estuarine areas such as Masonboro Sound are valuable coastal commodi-

ties. Estuaries. shallow earthen bowls where salt water and fresh water mix, play a special part in coastal processes. The low. salt marsh grasses of an estuarine community are home to many types of plants and animals that die and decompose, leaving an area rich in nutrients. These nutrients feed a food chain that is the basis for almost all coastal life. In fact, most of Masonboro Island — 87 percent - is classified as marsh.

Masonboro Island and its marshes are one link in a chain of barrier islands on the coast of North Carolina.

But Masonboro has some differences that set it apart from the others. First, most of the fresh water that filters into its sound washes off the nearby mainland instead of flowing from rivers. Second, the island has remained completely uninhabited and undevel-

Masonboro Island is flanked by its

oped throughout centuries of change.

two citified New Hanover County neighbors: Wrightsville Beach to the north and Carolina Beach to the south. These are two of the most visited beaches along the Tar Heel coast, and they only continue to grow — hotels and homes, bars and hot dog stands, roads, shops and restaurants.

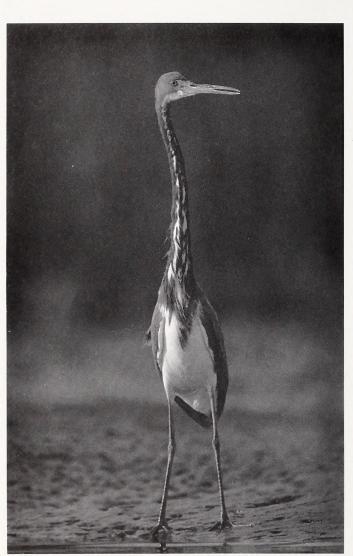
Like Wrightsville Beach,
Masonboro Island is lapped on one side
by brackish waters of the Intracoastal
Waterway and pounded by the Atlantic
Ocean on the other. Unlike Wrightsville,
Masonboro has no houses, no hotels, no
beachwalks, no asphalt. It is only
accessible by boat.

Island can be reached only by boat.
To launch a boat, use one of several public boat ramps at Wrightsville and Carolina beaches.
A quick ride will land you on the sandy beaches along the north or south ends

Only a small part of Masonboro Island's 8.4 miles is uplands, or lands that are never underwater or touched by overwash. These uplands are too narrow for development. What's more, Masonboro Island falls within the Undeveloped Barrier Islands System established by the Federal Coastal Barrier Resources Act of 1982.

Under this act, the island can't receive federal funds for public improvements or development. This means no water, sewer or roads. Masonboro Island properties can't get federal flood insurance either.

From that standpoint, it seems
Masonboro has little to offer — no
swimming pools or air-conditioned hotel
rooms. There's not even one tourist shop
that sells painted shell magnets or



Tricolored heron

sunglasses. No soundside docks beckon boaters to stop.

Because of this lack of amenities, you might think Masonboro Island attracts little attention and few visitors. It's the lonely island of the southern coast.

But on a hot summer day, Masonboro is crawling with everyone from fishermen to flip-flopped explorers. Boats jam the Intracoastal Waterway, and the curious squint, looking for a rare loggerhead turtle or maybe an ordinary black skimmer. From the top of the biggest dune on the north end, you can see eight miles of coast, marsh and forest — from the prickly little cacti that stick to your socks to the graceful curve of the beaches.

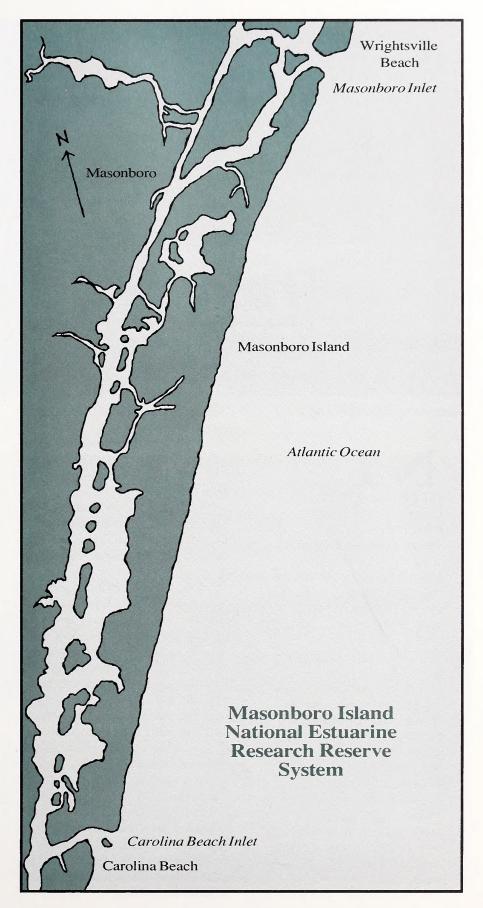
Masonboro Island is, well, nature in the nude. With all the development clogging other islands, it would be hard not to call Masonboro beautiful. Yet it's not like that last pitiful tree in Dr. Seuss's The Lorax, valued because it's all we have left. This island and the sound that borders it were majestic enough 200 years ago to stand out from the miles of untouched coast around it.

Crockette Hewlett wrote that in 1735, five years before the budding city of Wilmington was incorporated, an Englishman stood at the mouth of Cabbage Inlet Creek and gazed at the sound and distant Masonboro Island. Like the Indian, Italian, Spanish and Barbadian explorers before him, Richard Mullington liked what he saw. Like those who followed, he wanted to lay foundations there.

Later that year, Mullington purchased 640 acres from King George II and became the first property owner on the mainland along Masonboro Sound.

Since that time, the mainland has been changing. Mullington sold his property long ago. Families such as the Hewletts moved in, along with farmers, craftsmen and fishermen. There have been pirates, salt mines and Civil War shipwrecks. Wrightsville Beach and Carolina Beach began to develop as resorts in the late 1800s, and they haven't stopped since.

Continued





American oystercatcher

asonboro Island and North Carolina's other barrier islands were formed almost 5,000 years ago about the same time that ancient Egyptians were building the pyramids. Sand and soil were eroded from the land during the end of the last ice age and pushed into island formations as the glaciers melted and sea level rose, says Spencer Rogers, Sea Grant's coastal construction and erosion specialist. When sea level stabilized, the islands completed formation and gradually widened.

In 1932, the Intracoastal Waterway between Beaufort and the Cape Fear River was finished. Hurricane Hazel blew by in 1954.

Through 200 years of turmoil, Masonboro Island has serenely watched from a distance — and stayed completely the same. The tides rise and fall, and time passes.

True, there was the Carolina Inlet cut at the south end in 1952. In the 1960s and 70s, the U.S. Army Corps of Engineers built northern and southern jetties for Masonboro Inlet. The corps also deposits spoil on the island from the dredging of that and other inlets. And thousands visit the island and leave their footprints. But other than that, and the shifting of the sands, the isle of Masonboro looks a lot like it did back when Richard Mullington first set his eyes on it.

And that's the way most people want it to remain.

In 1983, before Masonboro Island was part of the research reserve system, an ad appeared in the Wilmington classifieds announcing the intention of some Masonboro Island landowners to build for the first time.

"Everyone assumed that no one would be able to do anything with it," says Wilmington attorney Bill Raney. "A number of people who thought Masonboro Island should be left like it is started wondering, 'What happens if they're successful?""

So a small group of people, calling themselves the Society for Masonboro Island, joined together to champion this barrier island. They even considered buying the land to keep it undeveloped.

The society called on Raney to help its members get better organized, and by the second meeting, they formed a nonprofit corporation. Today, the organization has a newsletter, a growing membership and an executive director, Marian T. McPhaul.

"The society is unique in that it has support from all over," says McPhaul.

"It's an incredible place," she adds.
"You can walk down eight miles of beaches. It's a real taste of isolation."

Many noticed Masonboro Island's charms.

"The state had a history of looking at Masonboro Island for acquisition," says Raney. There was talk of preserving it in

the 1950s. In the 1970s, it was considered for inclusion in the state parks system. But nothing came of either effort.

An amendment to the Coastal Zone Management Act of 1972 established the National Estuarine Sanctuary Program to acquire land for estuarine sanctuaries. Allotted \$3 million in matching federal funds, state coastal management programs were encouraged to purchase and preserve estuaries.

In 1983, North Carolina received more than \$1.7 million from the program to establish three estuarine sanctuaries: Zeke's Island in New Hanover County, the Rachel Carson estuary in Carteret County and Currituck Banks in Currituck County.

The state wanted another site. The Society for Masonboro Island wanted that site to be Masonboro Island.

Due to the society's efforts to promote the island as an ideal sanctuary, the chief of the estuarine sanctuaries and reserves division received hundreds of letters demanding the preservation of Masonboro Island.

In 1984, persuasive powers prevailed and Masonboro Island became part of the N.C. National Estuarine Research Reserve, as the program is now called, Masonboro Island, like all of North Carolina's estuarine research reserves, is managed by the Division of Coastal Management under the supervision of John Taggart.

Taggart and his two employees educator Joyce Atkinson and scientist Steve Ross — are responsible for all administration of the estuarine research reserve system.

Atkinson organizes field trips, visits schools, develops exhibits and brochures, and trains teachers. Ross. whose office is located across the waterway from the island, monitors the estuaries and works with the National Oceanic and Atmospheric Administration (NOAA) to fund research projects

Continued

those persons with a sentimental attachment to the area known today as Masonboro, the very name has a magical ring. It represents a place of gentle contentment, a verdant world of primeval beauty, where pines give forth an ancient sigh and moss drips heavily from crusty oaks.

Between the Creeks: A History of Masonboro Sound 1735-1970 by Crockette Hewlett



Fishing off Masonboro Island

Masonboro Island is uninhabited, many critters are attracted to its solitude. Peregrine falcons have been reported as seasonal visitors. Brown pelicans are common, frequently seen feeding and flying near the island. In the spring, large colonies of terns and other shorebirds seek its isolation for nesting. In summer, female loggerhead turtles drag their hefty bodies ashore to lay eggs along island beaches.

at reserve sites. He reviews research results and reports them to NOAA.

The three also formulate a management plan, which involves assembling a local advisory committee that represents a cross section of Masonboro Island users.

"To have Masonboro Island as a remnant of the original coast is important," says Taggart. "People can enjoy seeing what North Carolina is in its most natural context."

Yet the intent of the reserve system is to preserve estuaries as research sites. "It's a wonderful, wonderful laboratory for scientists and researchers," McPhaul says.

But McPhaul doesn't have to advertise the island's value to the research community. Scientists from Rutgers University in New Jersey are using the reserve to study treated wood and its contribution to water pollution. Graduate students and professors from the nearby University of North Carolina at Wilmington are regulars on the island.

Sea Grant researchers Jeffery Hill

and Robert Buerger, biologists at UNC-Wilmington, have been using computers to record the consequences of human impact on the island. To perform their research, the two take nothing to the island but their laptop computers and a camera.

"The goal of the Sea Grant research is to establish a data base of biological, chemical and physical aspects of Masonboro Island," says Taggart. "If we have a good background of data, then researchers who work on specific projects will already have that to work with."

Today there are few limitations on what you or I can do on Masonboro Island. There are a few standard regulations — don't use the island markers for target shooting, don't pull up plants, don't disturb anyone's research project. But these rules hardly interfere with enjoyment. People still swim, fish, watch birds, collect shells, surf, camp, sail and even hunt.

Yet the lack of public restrictions may be a problem for Masonboro



Walter Bateman drops in.



Black skimmers

Island. The research collected since 1992 by Hill and Buerger shows that the north end, south end and beach areas of Masonboro recover from human impact because of the erasing effects of overwash and winds. The middle areas of the island and marshes don't fare as well. Marsh grass dies, trash is dropped and land is eroded.

These findings haven't limited the public's access to the island yet. "I think the thing to bear in mind is we really need more data," Taggart says. "So you don't jump to any management conclusions based on that."

Yet the fear of altering Masonboro inspires its friends to action.

McPhaul reminds us to bring out what we take in. "Those kind of simple ideas are really important," she says.

Now that the island belongs almost entirely to the state, she sees the society's role as providing education. "We need to be very gentle with our use of it," she says. "The society can educate people who are apt to be going there."

Volunteers from the society sometimes pick up trash or set up regulatory signs. According to Taggart, surfers who cherish the island's waves often organize cleanup crews. Society members work with researchers to mark turtle nesting sites or create educational programs about how the island should be treated. The society also helps the Division of Coastal Management with the often tricky, always long process of acquisition.

The research reserve now owns 91 percent of Masonboro uplands. Almost half of these were purchased from willing sellers, or in some cases condemnation was declared. "The intent is to get the entire island so it will all be protected," says Taggart.

To get the last 9 percent may be a struggle. Some of the land is owned by the society, which plans to turn it over to the state. Other property is in private ownership.

"Sometimes it's hard to tell who owns the land," Taggart says. "There's often a very complex chain of title." In some cases, landowners are long dead, and heirs are difficult to find. In other cases, owners do not want to relinquish their land.

Think about it; it's easy to under-

stand why someone wouldn't want to give up Masonboro Island property. Imagine owning a part of something so undeveloped, so beautiful.

Most folks, though, love Masonboro Island for what it has to offer, and they want it to be in the hands of Taggart and the Division of Coastal Management. They understand that this way it would belong to everyone.

"It's been here," says McPhaul. "It'll be here. It's just how we take care of it that decides what will be left."

From Currituck to Calabash: Living with North Carolina's Barrier Islands, by Orrin H. Pilkey Jr., William J. Neal and Orrin H. Pilkey Sr., and Exploring the North Carolina National Estuarine Research Reserve, by John Taggart and Kathryn Henderson, were valuable sources for this story. For more information about the Society for Masonboro Island, call Marian McPhaul at 910/256-5777. Groups can visit Masonboro Island on educational cruises sponsored by Carolina Ocean Study Programs. For more information, call 910/458-7302.



TRASHING BALLS:

A First-Person Account of Eco-Sins and Redemption

By Jeannie Faris

Not too many years ago, the idea of separating garbage—plastics, bottles, newspapers and cans—sent me into a sanitation tailspin. I wanted my trash in one tidy place, covered and out of sight.

Today, on the cusp of Earth Day's 25th anniversary, I can say that I am recycling-redeemed. Not that I am without wasteful eco-sins, but I don't mind rinsing and separating anymore. There is certain satisfaction in knowing that I can make a difference, that I'm reducing my share of the 4.4 pounds of trash each of us creates daily.

In this respect, waste management experts say I'm pretty typical of most North Carolinians, especially those lucky enough to have curbside recycling services. But the state is still only a small fraction of the way toward its 2001 goal of reducing by 40 percent the waste that enters landfills and incinerators.

Clearly, we need to reverse an old maxim by making a molehill out of our mountain of waste. That goal won't be met by recycling alone.

So just as I'm getting the hang of recycling, taking cardboard to the collection center and harping on setting aside plastics, paper and aluminum, I have to consider some other options.

Precycling

Let's go shopping.

The grocery store is perhaps one of the best places to explain "precycling," another word for reducing and reusing the wastes that I let through my front door and stack on my office desk. The principle is simple: The more I manage to avoid wastes through front-end decisions about what I buy, the less I have to recycle, compost, landfill or incinerate.

The Environmental Protection Agency says precycling should be top priority when Americans make their trash disposal decisions. So I had to begin rethinking my shopping choices, weighing prices and personal preferences against the amount of packaging an item is wearing.

As I steer through grocery store aisles, brand names compete for space in my cart. They offer convenient single-serving containers, layers of brightly colored plastic, cardboard and coverings in tinfoil and shrink-wrap. In the pasta section, my eye catches a display of tasty-looking multicolored shells. I notice, a few steps closer, that they're layered sparsely over a slab of foam plastic and enclosed in shrink-wrap. So I reach instead for noodles bound in cardboard, a renewable resource. A few aisles down, individual servings of chocolate pudding glimmer from plastic containers, sealed with a tinfoil cap and bound in a cardboard carrier. I stop only to study the packaging. In the refrigerated section, I whisk past lunches of cheese, crackers and ham served in plastic containers and encased in cardboard boxes with plastic-film windows.

Examples of overpackaging are at every turn. Why do some plastic-contained deodorants still need cardboard coverings? Why are hairbrushes sold in plastic and cardboard packages? I'd never thought about it before. Cosmetics, too, seem to carry a lot of baggage. Scented soap is sold in a

cardboard box. Inside, each of three bars is wrapped in plastic and covered by tissue paper. As a consumer, I have been seduced by flashy, colorful boxes, layers of plastic wraps and tinfoil coverings. But while these packaging designs can be visually appealing on the shelves and even key to product safety, I now try to see them in a different

light. I imagine them as ugly waste piling up

in the landfill within a matter of days. These wrappings, so painstakingly designed to protect or beautify a product, comprise a third of the waste buried in landfills nationally.

In the workplace, companywide policies or loose office-by-office precycling can lighten the dumpster's

burden. It can be as easy as sending faxes without cover sheets. Or it can be as elaborate as a new product design or packaging policy. In Raleigh, a dry cleaning company accepts used hangers from customers and donates a penny for each of them to the Triangle Land Conservancy. I take my laundry there now. A major computer manufacturer has redesigned its packaging to reduce waste. I don't use this brand, but I'm convinced that package redesign is a good idea after ordering a new computer last year. It took weeks to get rid of the cardboard, foam and plastic leftovers.

On the public-sector side, some local governments have cited double-sided printing, ceramic mugs, refillable toner cartridges and scratch pads made from the clean side of printed paper as examples of their source-reduction efforts. The town of Pittsboro reuses computer sheets for memos, buys chemicals for its wastewater treatment plant in bulk and delivers packages by freight instead of express carriers to reduce packaging waste. But even as precycling takes these steps forward, only 17 percent of the state's 620 local governments said they had in-house or public-oriented source reduction programs in 1993-94.

Precycling is still gathering a foothold in North Carolina, although it's not an especially new concept, nor is it a local one.

It has global appeal, as I learned last year at the International Conference on Marine Debris.

Slashing both the supply and demand of wastes was repeatedly offered as a remedy to the disposal woes of industrialized and developing nations. It's the first step toward heading off waste before it can pollute our shores and waters.

But waste management is a complex issue. It is perhaps easier to ask people not to litter than to ask them to change their shopping habits and ways of doing business. Increasingly, however, people are making the effort and forward-thinking companies are making it policy.

Continued

Examples of overpackaging are at every turn. Why do some plastic-contained deodorants still need cardboard coverings? Why are hairbrushes sold in plastic and cardboard packages?

In the workplace, companywide policies or loose office-by-office precycling can lighten the dumpster's burden. It can be as easy as sending faxes without cover sheets.



Recycling

Recycling gives trash a new lease on life. Old plastic soda bottles can return as clothing and carpet. Aluminum cans and glass bottles reappear anew on the shelves under different brand names. Yesterday's news, in the pages of old magazines and newspapers, is reincarnated as tomorrow's newsprint. Newspapers are also returned as molded paper egg cartons, attic insulation and mulch.

The process works to the extent that people feel like they can make a difference and they support recycled markets. The EPA advocates this conservation-minded approach — and composting — after Americans have done their best to precycle.

Recycling began in earnest in 1988, although the record extends back 30 years. Over that period of time, the pace grew twice as fast as landfilling. The amount of waste that we recycle is now about 33 million tons, but it's still only a quarter of the 130 million tons of trash we bury.

In Raleigh, a drive to the office on recycling day tells me that people are willing to sort and store two weeks worth of garbage. The green bins are piled high with plastic milk bottles, newspapers and drink cans. At work, the university reclaims used paper, cans and glass that have been separated and stored. But the drive home on recycling day tells another story. Yards are strewn with throwbacks of unrecyclable plastic — peanut butter jars, vegetable oil bottles, juice and sports drink containers. For lack of a market, only a percentage of plastic we bring into our homes is being used again. Typically, depending on where you live, the containers marked PET 1 and HDPE 2 are most recyclable. These include soda bottles, some salad dressing containers and milk jugs. The rest, labeled 3 through 7, are usually landfilled or incinerated.

Recycling is most likely to flourish where curbside service offers a conservation-made-easy solution to waste disposal. Yet only about one-third of North Carolina local governments provide it. The rest of the

state must carry these recyclables to collection centers. And while it's less convenient,

people are doing it anyway. Overall, 475 government-run programs (curbside and drop-off collections) gathered 630,137 tons of recyclables in 1993-94. The savings can be measured in more than 1 million cubic yards of landfill space and \$10 million in disposal costs.

The first of the f

We go through these paces for a number of reasons. For one, it's illegal in North Carolina to landfill or incinerate certain trash, such as aluminum cans, whole tires, yard waste, lead-acid batteries, antifreeze, large kitchen appliances and motor oil. And no doubt, people are invigorated by the idea that they can make a meaningful nick in the mounting waste problem.

I tend to be drawn in by the point that recycling protects natural resources — fewer trees are cut, less ore is mined and less oil is used. It also prevents air and water pollution because many manufacturing processes using recycled materials create less air and wastewater discharges than those using virgin materials.

Old plastic soda bottles can return as clothing and carpet. Aluminum cans and glass bottles reappear anew on the shelves under different brand names.





The reuse-recycle movement speaks to the concerns of the energy-conscious. Recycling a single daily newspaper saves the energy equivalent of running a 75-watt light bulb for 24 hours. And it requires 90 percent less energy to remake aluminum cans into new ones than to meld them from virgin bauxite ore.

On the business side, the economy gets a leg up from new companies that collect and manufacture recyclable materials. Already, existing North Carolina businesses recycle a range of products, from latex paint and antifreeze to plastic bags and cat litter. Others encourage recycling through courtesy services, such as grocery stores that accept used plastic bags and gas stations that take back used motor oil. On the coast, Sea Grant and the state Office of Waste

Reduction recently collected used commercial fishing gear — nets and crab pots — for recycling. The East Carolina University Vocational Center squashed the soft nets for shipment to overseas markets, where their recycled fibers might reappear in sneakers, jacket liners or bicycle seats. The crab pots collected — almost 20 tons — will be reused by local scrap metal dealers.

But there are drawbacks, including the hassles and expenses of collecting and separating recyclables and reconditioning them before they become new products. Residues, such as sludge from de-inking old newspapers, also sully the process.

Perhaps most significant, however, is the lingering reluctance among consumers to buy recycled products for fear that they're inferior. Education can overcome this bias. Otherwise, without investments in the finished products, the market for recyclables will disappear and these items will join the other trash in landfills and incinerators.

Before recycling can outgrow its appeal as a popular feel-good effort, it has to be organized and supported on the buying end. Without this support, recycling day throwbacks will increase and existing markets will wither.

Composting

So far, so good. I can buy products that are recycled and carry less packaging. I can waste less paper. But now the EPA wants me to compost my yard and food wastes, cooking them in a sort of natural backyard oven. The process yields a dark brown, crumbly soil-like material with a sweet or musty smell.

The compost recipe calls for food scraps, yard clippings, leaves and dirt stacked in alternating layers. Heat inside a household pile builds to 90 F or more, causing oxygen molecules to break down, water molecules to gather and bacteria to multiply. Millions of microbes munch on grass clippings, dead leaves, fruits and vegetables. More heat is released, causing matter to

Yesterday's news, in the pages of old magazines and newspapers, is reincarnated as tomorrow's newsprint. Newspapers are also returned as molded paper egg cartons, attic insulation and mulch.

Recycling is most likely to flourish where curbside service offers a conservation-made-easy solution to waste disposal.

Continued



he compost recipe calls for food scraps, yard clippings, leaves and dirt stacked in alternating layers. Heat inside a household pile builds to 90 F or more, causing oxygen molecules to break down, water molecules to gather and bacteria to multiply. change form. An occasional stirring fuels the microbes with oxygen, and the trash heap becomes azalea fodder as early as six weeks.

I've quietly admired a couple of friends' compost piles, but I've always been a little skeptical of dumping my kitchen wastes into the yard. What if it stinks and bothers the neighbors? Or what if it attracts raccoons? Aren't there things I should avoid putting on it?

And how significant could my kitchen and yard wastes be anyway?

In reply to my last question, some statistical sleuthing suggests that these are meaningful portions of landfilled trash. Nationally, 7 percent of our waste comes from the kitchen while 20 percent is gathered from the yard. North Carolina was typical in the amount of twigs, grass clippings and leaves that it folded in with household trash before it banned yard wastes from municipal landfills in 1993. Since then, about 50 special sites have helped fill the void by accepting more than 310,000 tons of yard wastes annually.

My remaining concerns about composting can be addressed with a few simple tips: keep meat and dairy scraps off the pile to stave off odors and wildlife, turn the waste occasionally to control odor and hasten the composting, and build a fence around it to keep critters at bay. Another tactic is to place grass clippings and leaves around the base of plants as a ready-made mulch.

Of course, my recent awakening to this disposal option doesn't discount the generations of history behind composting. Rural communities have been doing it in some form for centuries. Even today, garbage services are not offered to many countryside addresses outside the city limits. So these homeowners try to lighten their load to the landfill by composting all the food and paper wastes that they can.

Composting can be done on a grander scale as well. Across the state, 64 local governments composted residents' wastes in 1992-93. In Winston-Salem, the city feeds its compost stack with tobacco wastes. The leaf waste is an excellent source of nitrogen, which the stack needs to operate, and diverts a significant amount of material from the landfill.

Landfills and Incinerators

When the best conservation efforts haven't gotten rid of the household and industrial trash, the EPA says landfills and incinerators should be the last resort.

This requires me to completely reverse the way I think about waste disposal. Traditionally, I have surrendered my trash to the can without another thought



North Carolina was typical in the amount of twigs, grass clippings and leaves that it folded in with household trash before it banned yard wastes from municipal landfills in 1993.

unless the garbage truck failed to show up. It's not been a last resort — it's been my only resort for everything except the recyclables I proudly fish out and present at my curbside.

But I should have known better. Four years ago, as a newspaper reporter in South Carolina, I discovered that documents landfilled years earlier, sprayed with sewage and buried 12 feet underground could still be read. I was part of a reporting team that picked through a bulldozed pit in the landfill in search of records discarded in violation of a court order. And we weren't disappointed. The pages were dirty, and they smelled awful, but they were nonetheless intact.

I question how many people realize that landfills are little more than trash storage sites. The contents are slow to decompose because they're usually buried and sealed without air or water. Garbage archaeologists have proven this by excavating organic garbage still intact more than 30 years after it was buried.

Still, it's no wonder that we rely so heavily on the convenience of landfills and incinerators. The roots of our disposal habits run deep, back to the early Roman empire where wastes were kept hidden from the privileged. By law, trash was carted out under the cover of night and dumped a mile outside the city limits. The crematorium — a cart-drawn trash burner — was invented in the late 1800s and early 1900s and pulled through the cities to collect wastes. This incineration tactic worked until waste began to include glass, aluminum and plastics.

Now, as the 20th century draws to a close, North Carolina's landscape hosts about 370 solid waste disposal sites: 66 municipal waste landfills, 31 industrial waste landfills, 150 land-clearing landfills, four incinerators, 14 yard waste composting facilities, 11 mixed waste processing facilities and 94 scrap tire collection sites.

The amount of trash flowing into these and other sites across the country continues to grow, but at a slower pace than in years past.

Nationally, landfills are projected to receive less waste in the year 2000 (about 109 million tons, or less than half of what is generated) than in 1980 (about 123 million tons, or 81 percent of what was generated). Of course, better disposal habits are not fully responsible for this decline. The glass, plastic and metal containers that we toss out today weigh considerably less than they did one or two decades ago, thanks to new manufacturing processes. Meanwhile, the use of incinerators has been slightly on the rise.

In North Carolina, the amount of trash buried has decreased per capita for three years straight, due largely to tipping fees, disposal bans, source reduction and recycling programs, and separation of land-clearing material from general waste. On average, just over 1 ton of waste is landfilled or incinerated per person annually. This is a 6.4 percent reduction over 1991-92, the year against which most state improvements are measured. But it's still a far cry from the 40 percent goal that looms six years off.

Continued

Statistics show that most North Carolinians and Americans still dispose of the bulk of their trash in landfills, although the rate of growth is slowing.

Earth Day Resolutions

These days, our wastes and disposal choices reflect our lifestyles. The 25th anniversary of Earth Day offers an opportunity to re-evaluate them, to resolve to place less emphasis on convenience and more on conservation.

Some resolutions can guide this process.

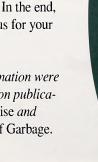


Use reusable alternatives such as sponges, cloth napkins and towels for spills.

- 1. Buy in bulk or large sizes to reduce the amount of product packaging that you bring home. Use bulk dispensers and your own reusable containers.
- 2. Avoid food sold in individual servings.
- 3. Substitute alternatives for toxic pest control and cleaning products, which can present disposal problems. For instance, substitute baking soda for tub and tile cleaners; exchange mineral oil and a few drops of lemon juice for furniture polish. Avoid oven, drain and toilet cleaners, metal polishes, chlorine bleach and spray pesticides. Instead, use borax, baking soda, vinegar, lemon juice and salt.
- 4. Reduce your use of plastic wraps and bags. Store food in plastic containers. Recycle dry cleaning bags where you can. And avoid degradable plastic bags — they don't degrade in landfills and they contaminate efforts to recycle plastic bags.
- 5. Minimize your use of paper products. Try reusable alternatives such as sponges, cloth napkins and towels for spills.
- 0. Companies listen to consumers, so tell them what you think. Refuse to buy a product you consider environmentally unfriendly and write or call the manufacturer about your concerns.

/. If you don't have the yard space for a compost pile, try vermi-composting indoors with worms. The state Office of Waste Reduction says there's no smell. All you need is a sturdy box, shredded newspaper bedding, a handful of soil and a bunch of leaves. Add enough water to keep the pile as moist as a wrungout sponge. Then, add about 2 pounds of red worms (2 to 4 inches long) and start feeding them kitchen wastes. In the end, you'll have a rich black humus for your plants.

Helpful sources of information were N.C. Office of Waste Reduction publications, EPA Journal, Waste Wise and Rubbish! The Archaeology of Garbage.



If you don't have the yard space for a compost pile, try vermi-composting indoors with worms.

EARTH

Roots of the Green Movement

By Jeannie Faris

If you were among the 20 million people who celebrated the first Earth Day 25 years ago, chances are you were on a college campus. In the two and a half decades that have elapsed, the event has evolved from a peaceful demonstration in the style of anti-war teach-ins to daylong family-oriented festivals across the nation.

Sen. Gaylord Nelson of Wisconsin founded Earth Day in 1970 in an effort to shake politicians out of their environmental lethargy.

At the time, teach-ins were popular on college campuses as a way to protest the Vietnam War. So, Nelson asked, why not organize a teach-in on the environment? He galvanized his senate staff and a group of college students and announced that Earth Day would take place in the spring of 1970.

National wire services ran with the story, and the event became a truly astonishing grassroots explosion, Nelson later said. Nothing like that had happened before, although it was not the senator's first effort to shine the public spotlight on the environment. In 1962, he had convinced President Kennedy to launch a nationwide conservation tour, spelling out in dramatic language the emerging threats to the environment. The tour began in 1963, and although it failed to put the environment onto the national agenda, it did plant the seed of an idea that grew into Earth Day seven years later.

In 1990, Earth Day was revived on a national level to celebrate its 20th anniversary. It gained the support of over 200 million people from 141 countries.

The 25th anniversary of Earth Day will be held April 22. Look for activities in your community.

In 1990, Earth Day was revived on a national level to celebrate its 20th anniversary. It gained the support of over 200 million people from 141 countries.

Choreography OF THE TIDES

By Carla B. Burgess

Aristotle once flung himself into the ocean in a desperate attempt to master the mystery of its ebb and flow. In my own quest to understand the tides, I merely held hands with an enlightened co-worker as we spun each other around the room in merry-go-round fashion — I, the Earth; she, the moon.

Of course, I had a lot more scientific information at the outset than did the heralded Greek philosopher, who thought the seas were produced by the Earth sweating. I already knew that the moon, the sun, gravity and centrifugal force were key

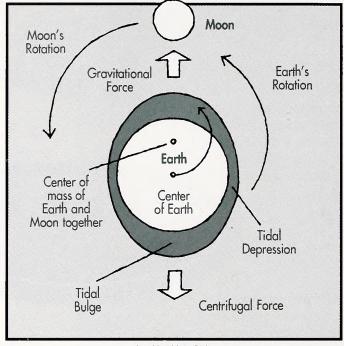
players in the daily rise and fall of the sea that we call tides. I just needed to sharpen the image in my mind with a hands-on dance of the orbs.

When we speak of the tide, we often describe it as "going out" or "coming in." From the fairly flat vantage point of a beach, it would seem so. Two times daily in North Carolina, the edge of the ocean tags the upper beach. And twice again it shrinks toward the horizon.

But take a global look at this phenomenon, and you realize that the surface of the seas actually lifts and falls in response to the gravitational pull of the moon and sun combined with the Earth's own movement.

The moon's gravitational pull exerts the strongest influence on the tides. Though much smaller than the sun, the moon is closer to our planet.

Imagine that the Earth's surface



Adapted from Marine Biology

On the open sea, the changing tides are barely discernible.

But where the edges lap at shorelines, the change in water level — or tidal range — is marked.

In North Carolina, the variance is only a few feet; but along the funnel-shaped Bay of Fundy in Canada, the tide may vary as much as 50 feet from low to high.

was enveloped completely by water. At any given time, the water would "bulge" at opposite sides of the Earth. One tidal bulge would appear on the side closest the orbiting moon, which draws the surface water toward it as it passes.

Another bulge of water would

appear on the opposite side of the Earth as a result of centrifugal force. To be precise, the moon doesn't circle the Earth. The two bodies are both orbiting a central point of mass as would a merry-go-round. So at the same time gravity pulls water toward the moon, the outwardmoving centrifugal force pushes a bulge of water away from the Earth on the opposite side. In other words, the water is flung outward, producing a mirror high tide.

Meanwhile, the Earth is spinning on its own axis, completing one rotation in 24 hours. This means that each point on Earth rotates through a tidal bulge twice a day.

Ideally, each spot on Earth would experience two high tides and two low tides daily. In reality, of course, the continents divide that hypothetical envelope of water into many oceans, each with coastlines and bottoms of various shapes and depths. So tides behave differently worldwide. Generally, the East Coast of North America, Europe and Africa all experience two of each every day.

If the Earth and moon were always in fixed locations, high tide and low tide would recur every 12 hours. But the moon is actually moving slightly faster than the Earth. Therefore, a complete tidal cycle requires one "lunar day," or 24 hours and 50 minutes. That means that successive low and high tides will be separated by about 12 hours and 25 minutes. If the tide rises at 6 p.m. at Atlantic Beach, for instance, it will be high again around 6:25 the next morning.

On the open sea, the changing tides are barely discernible. But where the edges lap at shorelines, the change in water level — or tidal range is marked. In North Carolina, the variance is only a few feet; but along the funnel-shaped Bay of Fundy in Canada, the tide may vary as much as 50 feet from low to high. Tidal range is also

Sun

Earth

New Moon

plus Sun

Moon

Moon 6

Spring Tide

affected by seasonal variations such as atmospheric pressure, rainfall and wind direction and man-made alterations in certain harbors.

Here Comes the Sun

The sun also plays a role in tidal flux, though its influence is less than half that of the moon. The

sun's gravity is most remarkable when it pulls in concert with the moon. Twice each month, the sun, moon and Earth are aligned. The combined pull of the sun and moon produces higher and lower tidal ranges known as "spring tides." Spring tides rise on the full moon, when the Earth is flanked by the moon and sun, and at the "new" moon. when the moon is between the Earth and sun.

The term "spring" refers to the leap in tidal range, not the season. Spring tides may add 1 or 2 feet to the mean tide levels along the North Carolina coast, causing slightly higher high tides and lower low tides. A common misconception along Tar Heel shores is that spring tides occur only once monthly, says Sea Grant specialist Spencer Rogers. This may be because in a given month, one of the two spring tides is more pronounced, he says. The

higher high tide is commonly thought to follow the full moon, but in truth it may occur after either the full or new moon.

At the first and third quarter, when the sun and moon form a right angle to the Earth, scant or "neap" tides occur. The tide-producing forces of the moon and sun cancel each other out, causing lower high tides and higher low tides.

Sun Sun Sun Gravitational Gravitational Gravitational pull of Moon pull of Moon Gravitational pull of Sun plus Sun pull of Sun Moon Earth Earth Earth Neap Gravitational Tide Spring Tide pull of Moon Gravitational Neap Moon

Full Moon

Adapted from Marine Biology

Tide

0

First Quarter

The term "spring" refers to the leap in tidal range, not the season. Spring tides may add 1 or 2 feet to the mean tide levels along the North Carolina coast, causing slightly higher high tides and lower low tides. A common misconception along Tar Heel shores is that spring tides occur only once monthly.

Other Extenuating Factors

The moon's do-si-do with the Earth takes an elliptical course. Once each month, only 216,000 miles separate our planet from the moon. At this close range, the moon is said to be at "perigee," and the increased gravitational pull causes higher tides than normal. About

two weeks later, at "apogee," the moon is farthest away from Earth and its gravitational grip on the tides slackens.

Tidal ranges have even greater variance when two or more of these monthly events overlap. For instance, a spring tide coinciding with the moon's perigee would cause more extreme fluctuations. Local weather conditions

> may either compound or dampen the intensity of the predictable astronomical events, says Rogers, Add to the equation a coastal storm such as a northeaster, he says, and you get flooding and accelerated erosion in beach communities. The notorious Hurricane Hazel skirted a spring tide to produce a storm of ferocious proportion.

The fierce and famous Ash Wednesday Storm, which swept the East Coast from the Carolinas to New England in March 1962, also attacked on a spring tide at the "dark of the moon." Coincidentally, the moon reached perigee within a halfhour of this astronomical alignment of the moon, sun and Earth. The result was a three-day storm that killed more than 40 people, toppled homes and businesses and submerged streets.

pull of Moon

0

Third Quarter

The next simultaneous perigee and spring tide — or "proxigean spring tide" — is predicted to occur Dec. 21. Keep your eye on the weather.

Helpful sources for this article included Marine Biology by Peter Castro and Michael E. Huber; Oceanography: An Invitation to Marine Science by Tom Garrison; and The Weather Book (USA Today) by Jack Williams.

By Larisa Tatge

Few action movies rival this dramatic scene, coming soon to North Carolina.

A large black-and-white osprey, with a wingspan stretching 6 feet, soars overhead. In a crashing flurry, the bird plunges into the sea, sinking its talons into a struggling fish. Soaring back into the air, it disappears in the distance.

The daring osprey, a member of the hawk family, stars as one of the state's most impressive — and visible — raptors.

"It's not difficult to see ospreys," says Jim Parnell, a Sea Grant biologist at the University of North Carolina at Wilmington. "They're most everywhere along the coast."

Also easy to spot are ospreys' nests, huge stick-and-twig penthouses perched on such lofty spots as treetops, power poles and radio towers.

Though conspicuous, the nests rarely encroach on human activity, according to Parnell. Occasionally, however, the large birds will nest on navigational lights along the coast, obscuring the colored signals.

"Sometimes the Coast Guard will have to move a nest because it's interfering with a navigational aid," Parnell says.

Apart from this minor problem, humans and ospreys rarely interact.

Some fishermen believe ospreys pluck the best fish from the water, but the opposite is actually true. "Ospreys take the easiest fish to catch — the sick, the weaker fish genetically — and help keep a good, healthy fish population," says Dick Brown, biology professor at Brunswick Community College in Supply. "They are no competition for a true sportfisherman.

"After all," Brown quips, "they have to do it with their feet."

In the 1960s, ospreys were fishing for survival along the East Coast, where pesticides were poisoning their food supply, thinning their eggshells and diminishing their numbers. Since the U.S. ban on DDT and other pesticides, the

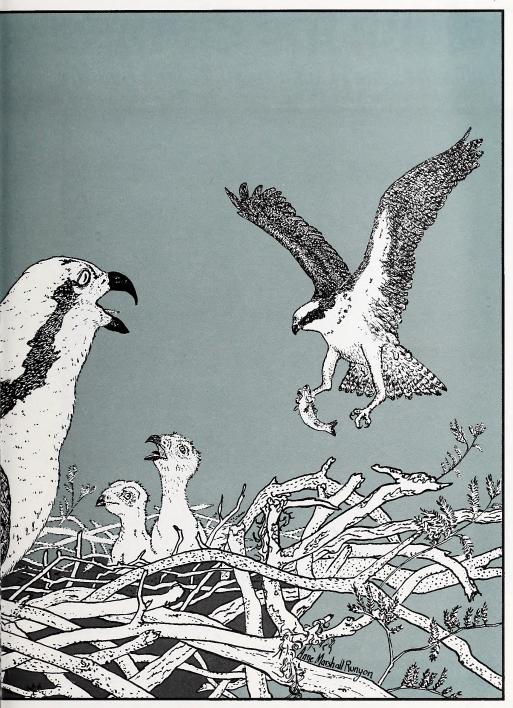
The A Bird's-Eye View

osprey population has rebounded to healthy levels, scientists believe.

However, pollutants remain a threat to many ospreys that winter in Central and South America, where uses of deadly pesticides are still rampant. "There may still be some problems, but it's not like it was," Brown says.

Ospreys usually return to North Carolina coasts, lakes and streams in April. In northeastern North Carolina, ospreys can be seen along the causeway of Lake Mattamuskeet. Inland, they nest near lakes such as Norman and Townsend — always near a bountiful supply of fish, Brown says.

Although ospreys are found worldwide, population numbers are scant. Biologists estimate that about 8,000 pairs make the United States their home base. Their nests are clustered in five main regions: the Atlantic Coast, the Gulf, the



Great Lakes, the northern Rocky Mountains and the Pacific Northwest.

The U.S. osprey migrates southward to the Caribbean, Central America and South America during winter months. The exception is the osprey population of Florida, which keeps a year-round domicile. Other isolated pairs, for no clear reason, choose not to migrate, Brown says. Unlike other raptors, young ospreys spend extended time on their

wintering grounds before heading north during their third year. This provides extra time for them to develop foraging skills.

The osprey, also dubbed the "fish hawk," stays close to abundant supplies of fish, except when migrating. In captivity, researchers have discovered that an osprey will refuse to eat fish that have not been freshly killed, Brown notes. This preference has created problems for some

researchers studying ospreys outside their natural habitat.

Ospreys are monogamous birds; they mate for life. During courtship, the male flaps vigorously over the nest of a female, calling out loudly and often presenting her with a fresh fish. Pairs return to the same nest year after year, adding twigs and bark to their ever-expanding home.

The female lays about three beige eggs, highly camouflaged to undermine threats from common predators such as bald eagles and crows.

During the incubation period, about four weeks, the female will remain with the eggs while the male hunts fish to bring back to the nest. Osprey chicks, or eyas, remain in the nest for about eight weeks until they fledge. A bird has fledged when it has the feathers it needs to fly and live independently.

An osprey's body is uniquely designed for performing its aquatic feats. Marked with black wings and a white underbody and head, the osprey boasts long legs for plunging into the depths of the water. The soles of the bird's feet are equipped with small, sharp spikes just right for snagging fish.

With keen eyesight, the osprey homes in on its prey from above the water's surface. The bird then plunges feetfirst into the water, often submerging its body completely, and snatches the fish with its talons. The fish is usually carried in flight head forward — a surprising ride for the fish, to be sure — until the osprey finds a spot to stop and devour it.

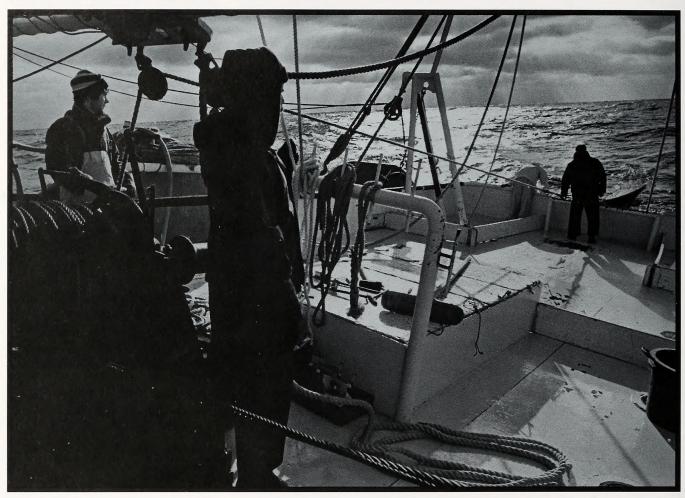
Ospreys have been reported to prey on birds, mice and other mammals, but these remain exceptions in their diet.

With patience and a dash of luck on your next trip to the coast, you might catch a glimpse of one of North Carolina's best coastal fishers.

For more information about ospreys, plan a visit to the N.C. Aquarium on Roanoke Island. The aquarium has a new osprey exhibit featuring live video footage of the nesting behavior of an osprey pair that returns each year to a tower nest outside of the building.

Taking the Plunge:

Sea Grant Studies the State's Commercial Fishing Industry



Foster Scott

By Larisa Tatge

Question: How do you keep North Carolina's fishing industry afloat without depleting the steadily declining fish population?

N.C. Sea Grant has been assigned by state lawmakers to find possible answers to this paramount problem. Hanging in the balance is North Carolina's seafood industry — and the fresh fish that ends up on your dinner table.

In March and April, Sea Grant will review proposals submitted by state researchers for this project, says Sea Grant director B.J. Copeland. Selected participants will reap portions of a \$225,000 research grant appropriated by the state General Assembly for the comprehensive study of North Carolina's fishing industry.

North Carolina officials lack basic information about the subject, Copeland says. Data is scant about how many people fish in North Carolina and what type of gear they use.

"Over the past decade, the amount of (fishing) effort has dramatically increased," Copeland says. "There are more pots, more trawl nets. The number of crab pots in the water has tripled."

Yet, "we don't know many things," he says. "By and large, we don't know how it (the gear) affects the environment." Scientists rank overfishing as a leading cause of the problem. As numbers of fish in the water shrink, fishermen have been forced to cast their nets farther out to sea. Meanwhile, sales of commercial fishing gear have steadily increased. Technology, which now enables people to net more fish at a faster pace than ever in the state's 400-year fishing history, has also emerged as an environmental nemesis.

In 1983, the N.C. Division of Marine Fisheries reported that 4,061 fishermen had vessel licenses for full-time fishing. Ten years later, that figure rose to 5,214. During that same period, quantities of edible finfish declined dramatically.

Tugging on the other end of the line is an ever-expanding net of government regulation that commercial watermen must adhere to and competition from an influx of recreational fishermen from other Atlantic states.

Population growth among North Carolina's 20 coastal counties may also have a significant effect on overfishing. About 711,000 permanent residents were reported living in the state's coastal communities in 1990, according to the U.S. Bureau of the Census. That number is expected to swell to 937,000 by the year 2010.

The Sea Grant project will examine the impact of all these factors, Copeland says. The information will serve as a basis for future policy, which could include revamping fishing licensing laws and beefing up law enforcement.

Copeland cites the top goal as identifying and defining the state's fishing gear, fishermen and fishing effort. The remaining four priorities are: assessing the Division of Marine Fisheries, devising ways to reduce fishing effort, revitalizing the fish population and developing better fisheries management techniques.

The Sea Grant study stems from legislation passed last summer by the General Assembly. In the same piece of legislation, a two-year ban on the sale of commercial fishing licenses was imposed. During the moratorium, licenses may be renewed and transferred, but no new licenses will be sold until June 30, 1996.

The moratorium is "a pause," Copeland says, to closely examine North Carolina's fishing industry for the first time.

A 19-member steering committee leads the Sea Grant study. It comprises members of both commercial and recreational fishing industries, academia and government. Also included are an ecologist, an economist and a social scientist. Copeland serves as a member of the committee.

"One of the greatest strengths of the committee is the quality of people we have," says Bob Lucas, committee chairman. "The learning curve is not very much. You don't want to spend a lot of time bringing people up to date on the issues. These people already are up to date."

A main obstacle for the group, however, has been "narrowing our focus," Lucas says. With so many issues at stake, sometimes it has been a challenge to closely examine smaller problems.

For now, the group's prime task is pinpointing the fishermen of North Carolina. "We let a lot of people do a lot of things. How many recreational people are actually doing commercial fishing? Doggone it, we don't even know who it is we're managing," Lucas says.

Improving fisheries management inevitably will require heavy-handed measures, which many other states have taken, Lucas says. Maryland, for example, charges \$2,000 for a fishing license and requires a one-year waiting period.

Lucas warned against taking small, hesitant steps toward reform. "It would take 20 years to do it that way, and I'm not up for it. In the long run, we'll get there quicker."

Copeland notes, "Reducing harvest and maintaining adequate fisheries populations are crucial to the future equitable use of a public resource for all North Carolinians."

There are no panaceas, he says, and new strategies will require compromises from all groups involved. The results, however, will write a new chapter in the state's coastal history.

Scientists rank overfishing as a leading cause of the problem. As numbers of fish in the water shrink, fishermen have been forced to cast their nets farther out to sea. Meanwhile, sales of commercial fishing gear have steadily increased. Technology, which now enables people to net more fish at a faster pace than ever in the state's 400-year fishing history, has also emerged as an environmental nemesis.

Tugging on the other end of the line is an ever-expanding net of government regulation that commercial watermen must adhere to and competition from an influx of recreational fishermen from other Atlantic states.

Madame President

Sea Grant communications director Kathy Hart was recently elected president of the N.C. Big Sweep board of directors. Big Sweep, the nation's largest statewide waterway cleanup, was launched in 1987 by Sea Grant.

Hart has worked with Big Sweep since its inception, primarily promoting the cleanup to the state's media. She previously served for one year as vice president of the board.

Big Sweep incorporated in 1993 and formed an 18-member board of directors to manage fund raising, educational projects and event coordination.

Sea Grant marine education specialist Lundie Spence also was voted an honorary member of the board in appreciation of the contributions she made in founding the cleanup and inspiring cooperation among coordinating groups.

This year's cleanup is set for Saturday, Sept. 16 from 9 a.m. to 1 p.m. For volunteer information, call 1-800-27-SWEEP.

An International Newsletter

One Sea Grant communicator will soon be thinking, talking and writing about trash on a regular basis.

Jeannie Faris is about to launch Sea Grant's latest periodical, *Marine Debris Worldwide*, an international newsletter devoted to ocean litter. As managing editor of the publication, Faris will be gathering information about scientific marine debris surveys and research, industry and urban waste reduction efforts, worldwide legislative efforts to halt ocean litter, and educational projects aimed at teaching the public or specialized audiences about the hazards and costs of marine debris.

The publication's audience will be waste management officials; the shipping and cruise industries; commercial fishing organizations; boating, diving and recreational fishing groups; coastal resource managers; marine scientists; manufacturers of products used in the

marine environment; and coastal cleanup organizers.

"The newsletter will serve as a communications tool for audiences that are interested in marine debris," Faris says. "These groups have common concerns, which bring them together at international conferences, but otherwise they've remained fragmented. Educators have not regularly exchanged information with researchers, and industries have not communicated with cleanup organizers. So this newsletter will help keep these people in contact."

The newsletter is funded by the National Sea Grant College Program through a grant from the National Marine Fisheries Service.

For a complimentary copy of the first issue, write Sea Grant, Box 8605, N.C. State University, Raleigh, NC 27695. Or call 919/515-2454.

New Staff On Board

Rachel Wharton and Larisa Tatge are the new names you'll notice in the *Coastwatch* masthead. They've joined the Sea Grant staff part time.

Wharton is a recent graduate of N.C. State University, where she received her bachelor's degree in language, writing and editing. She worked previously for *Business Leader* and *Technician*, the NCSU student newspaper.

Tatge is a graduate student at NCSU working toward a master's degree in international studies. She received her undergraduate degree in English literature from Oklahoma State University and worked for two years as a reporter for *Tulsa World*, a daily newspaper in Tulsa, Okla. She is fluent in Spanish.

Both writers will be producing *Coastwatch* articles as well as handling other writing and editing assignments.

"Rachel and Larisa are welcome additions to the staff," says Kathy Hart, Sea Grant communications director. "They bring enthusiasm and a fresh perspective to the many topics we tackle on a daily basis."

Doll Wins Take Pride in North Carolina Award

At times last year, storm drain stenciling was practically an around-the-clock project for Sea Grant water quality specialist Barbara Doll. She found herself assembling stencil kits for 43 cities, testing paints and grids, rounding up volunteer painters, contacting city liaisons, planning press releases and fliers, and filming a video. But these efforts paid off as volunteers invested an estimated 700 hours of their time in the project.

Now, Doll and storm drain stenciling have been recognized on a statewide level with a 1994 Take Pride in North Carolina Award.

"I want to take this opportunity to commend you for the outstanding work you are doing to promote wise use of our state's public resources," Gov. Jim Hunt wrote in his congratulatory letter to Doll. "Your involvement in this program helps to ensure that future generations also can enjoy and benefit from our state's natural, historic and cultural resources."

The awards program recognizes outstanding stewardship projects that increase awareness of natural and cultural resources and encourage an attitude of stewardship and responsibility toward these resources.

Doll's stenciling project met these criteria by assembling and equipping volunteers to paint storm drains in cities throughout the state's coastal watershed. The "KEEP CLEAN!" stencils identify the coastal waters to which these drains flow, including Albemarle Sound, Pamlico Sound, Cape Fear River, New River, other sounds and the ocean. Once painted, the messages can raise awareness of coastal waters and alert the public that dumping trash into storm drains can pollute these valuable resources. Every year, antifreeze, motor oil, cigarette butts, paint, plastics and yard wastes wash into our waters, spoiling them for people and wildlife.

The project has support from N.C. Sea Grant, N.C. Cooperative Extension

Service, U.S. Fish and Wildlife Service, N.C. Big Sweep, N.C. Department of Environment, Health and Natural Resources (divisions of Water Resources, Coastal Management and Environmental Management), N.C. Coastal Federation and the city officials who handled the stenciling kits and coordinated the volunteer painting efforts.

Fine Art

Perhaps you've noticed the lovely pen-and-ink drawings adorning our nature pages in recent issues. These are the work of Raleigh artist Anne Marshall Runyon.

Runyon specializes in animal portraits and nature drawings. You may have seen her detailed drawings in *Wildlife in North Carolina*, *North Carolina Wild Places* — a Closer Look or Coastal Capers, a Sea Grant publication.

"I am fascinated by the diverse beauty of all life and by the stories of our natural world," Runyon says. "Sometimes, I will act out a gesture that I am drawing — trying to feel the bend of the branch, the tension of the stalking predator or the alarm widening the eyes of prey."

The ability to accurately capture natural settings and animals on paper has earned Runyon's work plenty of praise.

"Anne's drawings add a new dimension to the nature page," says Carla Burgess, *Coastwatch* senior editor. "Her capacity for detail and accuracy makes her drawings seem alive. It really helps our readers visualize the animals and plants we write about."

Coastwatch Honored

Coastwatch was recently chosen as winner of the Conservation Communications Award in the 1994 Governor's Conservation Achievement Awards Program sponsored by the N.C. Wildlife Federation and the National Wildlife Federation.

Each year, the N.C. Wildlife Federation honors a publication, person or media outlet that educates the public about the state's natural resources and urges the conservation of our environment.

"We were pleased to be selected for

such a prestigious award," says Kathy Hart, *Coastwatch* managing editor. "We work hard to make *Coastwatch* an educational magazine, and we are glad that others have recognized our efforts."

Knauss Fellow Named

Another N.C. Sea Grant nominee has been selected as a Dean John A. Knauss Marine Policy Fellow by the National Sea Grant College Program.

Fernando Leyva, a first generation Cuban-American, recently completed his master's degree in marine biology at the University of North Carolina at Wilmington. He received his undergraduate degree from Davidson College, where he concentrated his efforts in chemistry, biology, philosophy and education.

Between his undergraduate studies and graduate school, Leyva spent two years teaching underprivileged teen-agers in an alternative high school in Charlotte. There, he learned to relay science to teens who had little understanding of or interest in the subject.

Now Leyva would like to focus his career on marine policy and bridging the gap between good scientific information and effective fisheries management policy.

The Knauss program matches highly qualified students with hosts in Congress, the executive branch or appropriate associations/institutions for a one-year paid fellowship in Washington, D.C. The fellowship will allow Leyva to begin pursuing his goal. He will be working in the Office of Sustainable Development within the National Oceanic and Atmospheric Administration.

Files of Fish

The N.C. Division of Marine Fisheries (DMF) keeps a lot of fish in its files. The endorsement-to-sell (ETS) law, which requires commercial fishermen and seafood dealers to be licensed to buy and sell seafood, tracks everything fishy. By keeping close tabs on what commercial fisherman catch and sell, the program delivers information — information about fishing resources, what they are and where to find them.

The ETS program works in three steps. First, all fishermen who sell their catch must buy a license. All business owners who purchase seafood — restaurateurs, fishing pier owners and seafood dealers — must buy a dealer's license.

In the second step, a trip ticket is completed. When fishermen sell their catch to a dealer, they record the date, the number and type of fish caught, the location where the catch was made, their license number and the gear they used. The dealers then provide copies of the trip tickets to DMF "port agents" in Wanchese, Washington, Morehead City, Harkers Island and Wilmington. The agents also help dealers and fishermen by answering questions, providing tickets and taking samples.

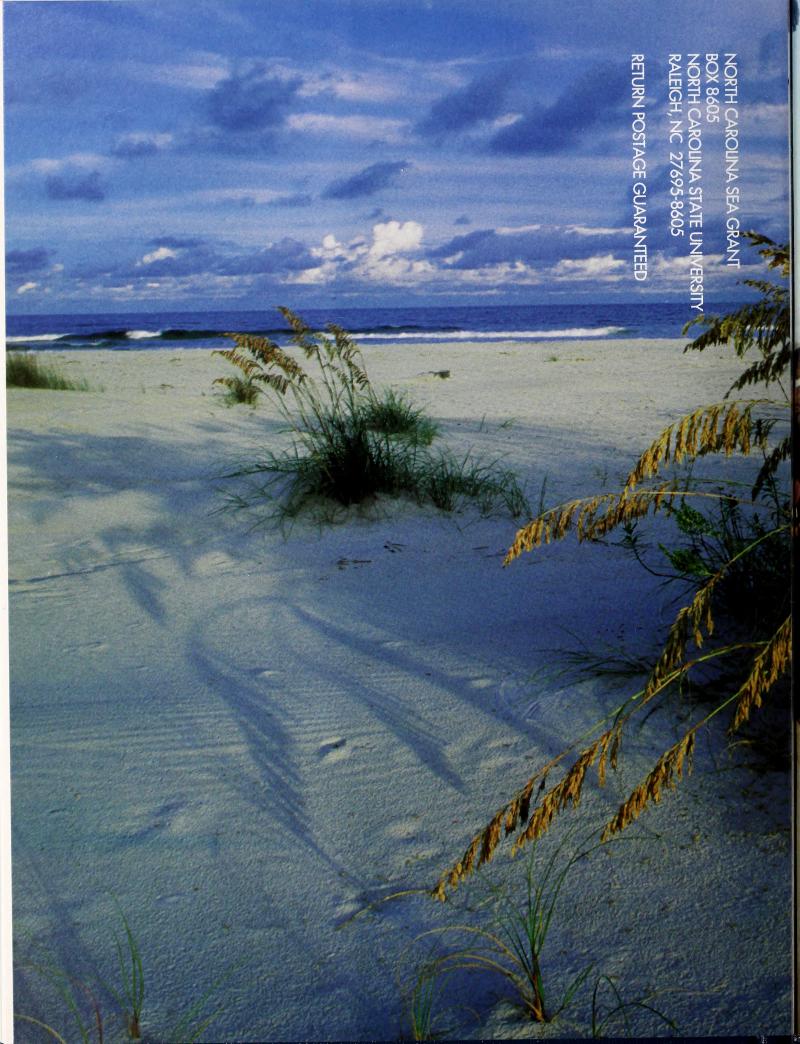
The third step — data collection — is also important. The information from the trip tickets is compiled by computer. Although an individual's information is kept confidential, summaries of information can be released and put to use.

"ETS information gives us a solid foundation on which to base management decisions," says Rick E. Marks, the DMF statistics coordinator. "Economically, the landings from commercial fishermen show us exactly what benefit the commercial fishing industry has to North Carolina."

ETS information can be used for many purposes. Just recently, the National Marine Fisheries Service reopened the East Coast commercial shark season based on ETS information from North Carolina. It can be used by fishery management councils, trade associations and the public. Most importantly, Sea Grant can use the information in its state-supported fisheries study (see story, page 22) to get a more accurate picture of fishing effort in the state.

The ETS law, which has been in effect since January 1994, is part of a state effort to gather information about the North Carolina commercial fishing industry, Marks says. "We need to get accurate information to effectively manage our marine resources, and we need the commercial fishermen and dealers to help us do it."

For more information about the ETS program, call Marks at 1-800/682-2632.





Coastwatch Staff:

Kathy Hart, Managing Editor
Jeannie Faris and Carla Burgess,
Senior Editors
Larisa Tatge and Rachel Wharton,
Staff Writers
L. Noble, Designer
Sandra Harris, Circulation Manager

The North Carolina Sea Grant College Program is a federal/state program that promotes the wise use of our coastal and marine resources through research, extension and education. It joined the National Sea Grant College Network in 1970 as an institutional program. Six years later, it was designated a Sea Grant College. Today, N.C. Sea Grant supports several research projects, a 12-member extension program and a communications staff. B.J. Copeland is director. The program is funded by the U.S. Department of Commerce's National Oceanic and Atmospheric Administration and the state through the University of North Carolina.

Coastwatch (ISSN 1068-784X) is published bimonthly, six times a year, for \$15 by the North Carolina Sea Grant College Program, Box 8605, N.C. State University, Raleigh, NC 27695-8605. Telephone: 919/515-2454. Fax: 919/515-7095. E-mail: k_hart@ncsu.edu. Second-Class Postage paid at Raleigh, N.C.

POSTMASTER: Send address changes to *Coastwatch*, N.C. Sea Grant, Box 8605, N.C. State University, Raleigh, NC 27695-8605.

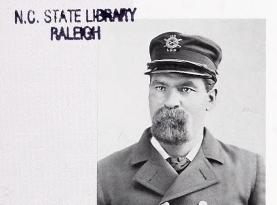
Front cover photo of unidentified shipwreck at Hatteras Island by Michael Halminski.

Inside front cover photo of fishing boat on the Newport River by Scott D. Taylor.

Printed on recycled paper by Highland Press Inc. in Fayetteville, N.C.



MAY 23 1995



Page 2



Page 10



Page 16

Features

The Pea Island Lifesavers: Black Surfmen Remembered

The Pea Island Lifesavers were men of courage and determination. They were also men of color during a time when racial tension swelled. After Reconstruction and beyond World War II, an all-black crew manned this Outer Banks station. These surfmen rescued several hundred people from the churning ocean. But equally important, they transcended prejudice and relentless attempts to sabotage their success. Writers David Wright and David Zoby share their research into

Shipwrecked!

The Graveyard of the Atlantic Brings Prosperity to Coastal Communities

Thousands of shipwrecks lie off the coast of North Carolina, a reminder of the fury of nature and the ravages of war. But these disasters of yesteryear brought fortune to Outer Banks communities. Rescued cargo often sustained villagers, and the prospect of shipwrecks created jobs for lifesavers. Coastwatch writer Larisa Tatge found there's residual profit in these sunken treasures even today, as divers and tourists visit the wreck sites and historians strive to preserve them. 10

Standing by Their Men: Women Speak for Commercial Watermen

A unified voice can be heard above the din over regulation of the commercial fishing industry. Though the hand on the helm of fishing vessels is typically male, this chorus is decidedly female. Free-lance writer Julie Ann Powers introduces readers to the women — wives, girlfriends, mothers and daughters — who are becoming the political voice for North Carolina's commercial watermen. 16

Diamondback Terrapins: Habits and Habitats

What's that snapping and crackling in the marsh? Maybe it's the sound of a diamondback terrapin with a snoutful of

N.C. Commercial Fishermen Recycle 22 Tons of Used Equipment

A novel project on the coast this spring had fishermen sorting through nets and smashing their crab pots for

Departments



Lifesaver Herbert Collins in the Pea Island surfboat, circa 1940

By David Wright and David Zoby

The surfmen of the Pea Island Lifesaving Station built a reputation on hard work, bravery and skill. Along the Outer Banks and East Coast, they were a respected crew. known for assisting more than 30 vessels in distress, rescuing more than 200 people and losing only seven mariners.

But the lifesavers' skill wasn't all that set them apart from other surfmen along the coast. The Pea Island station was manned completely by blacks the country's only such station.

Kimball, did not receive federal money to build stations along the Outer Banks until 1874. These first seven stations were manned by a keeper and six surfmen. Their orders were clear: Come to the assistance of any vessels or persons in need.

Black watermen along the Outer Banks enlisted in the Lifesaving Service. Integrated rosters, called "checkerboard" crews, were common along the coast with as many as 19 blacks serving in North Carolina stations from 1874 to 1879. Black

Between 1876 and 1878, the disasters came in quick succession. Three highly publicized maritime shipwrecks occurred off the Tar Heel coast. More than a half million dollars in property was lost. But more importantly, 211 people died.

Kimball turned his attention to the Outer Banks to determine why people were dying along an area manned by lifesavers. He learned the problem ran much deeper than long stretches of beach and short seasons. Nepotism was ruining the service.

The Pea Island

Black Surfmen Remembered

Today locals, white and black, are quick to remark on the excellent reputation of the lifesavers. At the time the first black keeper was appointed, however, the idea was not wholeheartedly embraced. The first all-black Pea Island crew battled more than the ocean's tempests. They fought amid a sea of prejudice and waves of hostility in the local community.

Life on the Outer Banks in the late 19th century was hard, particularly after the devastation of the Civil War. Commercial fishing was limited, tourism nearly unheard of and poverty as widespread as the beaches were barren. As a result, everyone wanted a job with the federal government.

Ships had wrecked at alarming rates off the North Carolina coast since the beginning of trans-Atlantic navigation. However, the U.S. Lifesaving Service, which was officially established in 1871 under General Superintendent Sumner

surfmen, however, served only in the lowest ranking positions on the duty roster and often doubled as the stations' cooks. Despite their low ranks, visiting Northern inspectors remarked that several of the black surfmen were among the best in the district.

Early service along the barrier islands was fraught with difficulties. With so few stations, the length of patrols was often as much as 15 miles — too long to be expedient in reporting disasters and rendering aid. At the outset, lifesavers were employed for only four months of the year, December through March, after which the stations were padlocked. Consequently, lifesaving operations often had little effect in saving lives. The situation was ripe for disaster.

During an 1875 tour of the Carolina stations, government inspectors found 15 surfmen, including four keepers, unqualified to serve. One was a blacksmith, another a teacher, and neither had any knowledge of the sea. Another had been hired even though he was physically unable to perform the tasks demanded of a surfman.

Kimball successfully appealed to Congress in 1878 for more funds to expand the number of stations in the district and lengthen the active season. But improvements in hiring were slow. All too often, keepers and crews were hired for reasons other than ability.

In the early morning of Nov. 30, 1879, the schooner M&E Henderson

Continued



An integrated "checkerboard" crew on the Outer Banks around the turn of the century

came ashore two miles south of the Pea Island station on what appeared to be a clear morning. Inexplicably, aid from the station arrived late. Four men were lost; the three survivors found their

The first all-black
Pea Island crew battled more
than the ocean's tempests.
They fought amid a sea
of prejudice and waves of
hostility in the local community.

way ashore unassisted by the lifesavers. Inspectors from Washington, D.C., already troubled by incompetency in the Carolina

service, found the keeper's report of the incident misleading.

Upon further investigation, inspectors learned that the Pea Island station keeper and other surfmen may have been absent from the station when the *Henderson* came ashore. The keeper and his men frequently left the station understaffed, often to go hunting.

Kimball realized that district incompetence might compromise the fledgling Lifesaving Service as a whole. So he approved radical changes to ensure adequate service in North Carolina. In January 1880, he authorized the transfer of Richard Etheridge, a black man who held the number six surfman position at the Bodie Island station, to Pea Island as keeper.

Although the appointment of a black man to a position of authority was becoming increasingly unpopular in the post-Reconstruction South, the choice of Etheridge as keeper was a natural one. In his report, Frank Newcomb, one of the two Northern inspectors, described Etheridge as follows:

"Richard Etheridge is 38 years of age, has the reputation of being as good a surfman as there is on this coast, black or white, can read and write intelligently, and bears a good name as

a man among the men with whom he has associated during his life."

The other inspector, Charles Shoemaker, added: "I am aware that no colored man holds the position of keeper in the Lifesaving Service ... and yet such as are surfmen I am fully convinced that the interests of the Lifesaving Service here, in point of efficiency, will be greatly advanced by the appointment of this man to the Keepership of Station No. 17."

Etheridge was a proven leader. Born on the beaches near Oregon Inlet, he had grown up by the water, learning the secrets of the sea and the tides along the Outer Banks.

When the Union Army opened its ranks to blacks during the Civil War in 1863, Etheridge enlisted. He served in the 36th U.S. Colored Troops, fought at the Battle of New Market

Heights and was eventually promoted to regimental commissary sergeant.

Etheridge was a man committed to justice. While fighting for the emancipation of slaves, he also engaged in the struggle behind Union lines to end

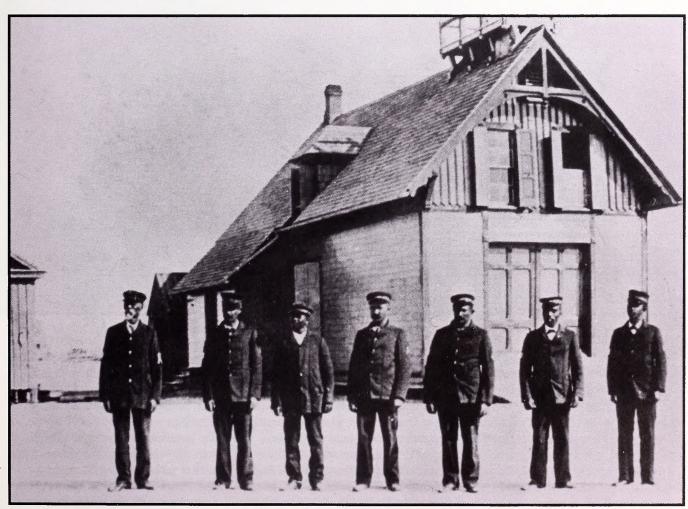
mistreatment of blacks. In 1865, he drafted a letter to the commissioner of the Freedmen's Bureau on behalf of his fellow black soldiers of the 36th to protest Union

Black watermen along the Outer Banks enlisted in the Lifesaving Service. Integrated rosters, called "checkerboard" crews, were common along the coast with as many as 19 blacks serving in North Carolina stations from 1874 to 1879.

injustices at home on the Outer Banks.

"... [T]he white soldiers break into our houses, act as they please, steal our chickens, rob our gardens, and if any

Continued



The all-black crew of the Pea Island Lifesaving Station pose with keeper Richard Etheridge (on far left) in 1896.

Early service along the barrier islands was fraught with difficulties. With so few stations, the length of patrols was often as much as 15 miles too long to be expedient in reporting disasters and rendering aid. At the outset, lifesavers were employed for only four months of the year, December through March, after which the stations were padlocked.



The Pea Island Station, circa 1940

one defends their-Selves against them, they are taken to the gard house for it."

In 1866, a year after the war ended, Etheridge left the military. He returned to the Outer Banks, where he married and resumed his life as a fisherman.

Etheridge joined the Lifesaving Service during its first years, serving at the Oregon Inlet station in 1875 and later at the Bodie Island station, where Newcomb and Shoemaker found him occupying the lowest ranking position on the duty roster.

The former keeper at Pea Island had hired a checkerboard crew, but Etheridge's would be all black. The day he arrived to assume the keepership, the white surfmen abandoned the station, unwilling to serve under a black man. To complete Etheridge's crew, Newcomb decided to transfer black surfmen from other district



stations to Pea Island.

But more resistance was to come. Prominent whites in the area tried to intimidate the black lifesavers out of the service. They warned the surfmen that the Northern inspector had no intention of keeping them at Pea Island, but rather was scheming to force them out of the stations entirely. One man, Joseph Case, did not know whom to trust; he resigned. But

Newcomb and Etheridge were eventually able to hire a full crew, filling the empty positions with black watermen. These men served the remainder of the spring season.

In late May, just after the stations closed for the inactive season, the Pea Island station burned to the ground. Newcomb, suspecting arson, immediately launched an investigation.

He quickly learned that the Outer

Banks community as a whole condemned the station's burning. Only a few people had a vested interest in removing Etheridge and his crew. Although the most logical suspect was the previous Pea Island keeper, the testimony of people who had been on the island that day pointed elsewhere.

Two brothers who lived on the island and served at the Bodie Island

Continued

station were reportedly in the vicinity of the station on the night of the fire. Newcomb pursued that line of investigation.

He found it odd that the brothers, who were aware of the fire as it burned, did nothing to notify nearby

William Bowser grew up hearing the stories from his grandfather. He always knew that he, too, would someday be a surfman. "It was in my blood that I would go to Pea Island," says Bowser. "That's all we had on our minds. We all wanted to be just like them."

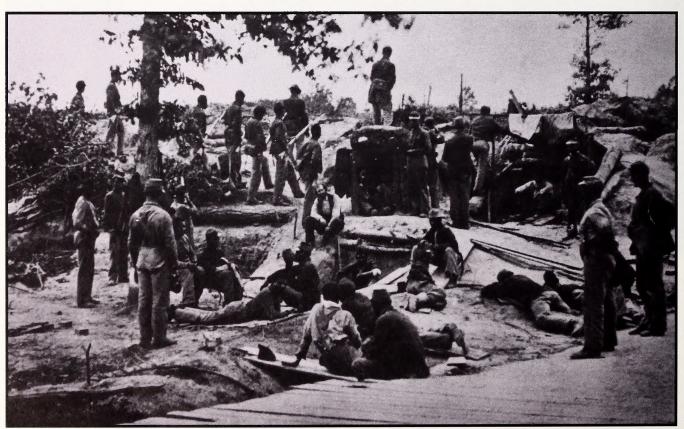
Lifesaving Service officials. While the brothers were under questioning, their story conflicted with testimony of other witnesses. One of the brothers was the highest

ranking surfman at Bodie Island and a candidate for keeper of a station; the other brother and a third suspect had served as substitutes but sought full-time positions in the service. They had interest in removing the black crew.

In fact, the brother who held the highest rank had been heard commenting "[t]hat it would be an easy matter for a surfman who had a falling out with his Keeper, to set a station on fire, or ... injure the property in such a manner as to throw blame on the Keeper and cause his dismissal from the Service."

Newcomb reported to Kimball: "The inference is that ... [the third suspect] was employed by [the brother who was only a substitute] to set the station on fire, the object being, to secure the removal of the present colored Keeper, thus enabling [the brother] to succeed him and giving [the third man] a situation as surfman in the station." According to Newcomb, the higher ranked brother had devised the scheme.

Although Newcomb felt strongly that these men were involved in burning the station, Kimball chose not to pursue the matter further. Kimball was aware of the risk he had taken in appointing Etheridge. He feared that prosecuting the



irtesy of the Valentine Museum, Richmond, V

First black station keeper Richard Etheridge was a proven leader, having joined the Union Army when it opened its ranks to blacks in 1863. He fought tirelessly against mistreatment of his fellow soldiers in the 36th U.S. Colored Troops.



Former Pea Island surfman William C. Bowser displays a photograph of his grandfather, who served under Richard Etheridge at the famed Outer Banks station.

brothers might damage the fragile infrastructure he was trying to build in the already troubled district.

The burning of the Pea Island station did not mark the end of the all-black crew. Instead, the station thrived. The season following the fire, the crew worked from the stables. A few months later, they rebuilt their station.

Etheridge ran his station with military rigor. He followed orders to the letter and expected the same of his men. He drove them like soldiers, relentlessly drilling them with the lifesaving equipment, quizzing them on their knowledge of procedure and ensuring that the station was kept in impeccable condition. The Pea Island crews became known for their daring in the surf and their commitment to duty, often under perilous circumstances.

Their most daring effort came on

the night of Oct. 11, 1896, when the schooner *E.S. Newman* ran aground south of the station during a hurricane. The *Newman*'s captain had beached the schooner in the hope of saving his crew, which included his wife and 3-year-old daughter. The storm was so violent that Etheridge had canceled patrols for the night for fear of losing one of his men to the wind and surf that swept across the inundated beach.

From the observation tower, surfman Theodore Meekins sighted a light off the coast. Etheridge immediately mustered his crew and led them two miles to the wreck. Once there, they realized that their lifesaving equipment was inoperable in the extreme conditions. Reacting quickly, Etheridge ordered that a line be tied between two men and that those men swim the line to the ship. Ten trips were made back and

forth to the beach, one by one transporting the crew of the *Newman* to safety.

Over the generations, serving at the Pea Island station became a time-honored tradition among the young black men of Roanoke Island. William Bowser grew up hearing the stories of the *Newman* and other rescues from his grandfather, who had served under Etheridge. He always knew that he, too, would someday be a surfman.

"It was in my blood that I would go to Pea Island," says Bowser. "That's all we had on our minds. We all wanted to be just like them."

David Wright, a professor at the University of Massachusetts, and David Zoby, a professor at Virginia Commonwealth University, have been researching the Pea Island Lifesaving Station for the past year.

Shipwrecked!



Robin Gerald surveys the remains of the 1933 G.A. Kohler washed up on Hatteras Island.

The Graveyard of the Atlantic Brings Prosperity to Coastal Communities



After a storm the sea turns blue, as in pictures. Near the shore. tree trunks and roots torn up by the storm float gently along. Gulls emerge to fly over the water. That morning, when the breeze died down, the surface of the water turned metallic and the raft glided along in a straight line. The warm wind felt reassuring to my body and my spirit.

> Gabriel Garcia Marquez, "The Story of a Shipwrecked Sailor"

By Larisa Tatge

In seafaring lore, shipwrecks evoke images of evil tempests and sunblistered sailors stranded on remote islands. For historians, sunken vessels serve as telling points on the map of civilization. They have created communities and sustained others that could have disappeared.

The combination of the shoals, capes and the convergence of two major currents, the Labrador and the Gulf Stream, makes the North Carolina coast treacherous and its maritime history unique among coastal states. The shoals, or shallow fingers of sand, were once a sea captain's nemesis. About 3,700 sunken vessels lie off the Carolina coast, most within five miles of shore.

Although a shipwreck brought death and financial ruin to some of the early European explorers, it meant prosperity for others. Since the days of the earliest Spanish explorers, shipwrecks have provided economic sustenance for coastal communities. As historian David Stick wrote in his famous book, "Graveyard of the Atlantic," shipwrecks landed new residents on the Outer Banks in the early 16th century. By the turn of the 19th century, the shoals had snared hundreds of vessels.

One of the most disastrous periods for maritime travel occurred between 1893 and 1899, when an average of one ship was reported lost each week.

Yet the misfortunes of sea travelers breathed life into the coastal economy. The wrecks provided jobs for professional salvagers and lost goods dealers, as well as lifesavers. Towns often organized their own wreck commissions to distribute the rescued shiploads of sugar, salt, coffee, cotton, metal, marble and lumber. Many times, however, the bounty floated away or dropped to the floor of the sea — along with the mariners who accompanied it.

But when sextants and nautical tables gave way to Loran navigation and other modernities, seagoing vessels no longer floundered along the Tar Heel coast. The Gulf Stream and the Labrador currents still beat against the shoals with a vengeance, but technology tamed the seafaring life, making navigation more predictable.

Tales of shipwrecks lived on in coastal towns, where songs were written and stories told throughout generations about famous tempests and brave lifesavers. More recently, through advances in technology, the ardor of preservationists and the zeal of tourists, shipwrecks are surfacing as relics for study, preservation and exploration.

Since Jacques Cousteau's development of the Aqua-Lung in 1943, scientists have defied nature and meandered freely beneath the ocean's surface. Today, diving has evolved into a popular hobby and accounts for many coastal tourism dollars. Divers plunge to spy the skeletal remains of 17th century trading ships, Civil War blockade runners and German U-boats that litter the ocean floor.

Archaeologist Richard Lawrence was lured as well. As a student at the University of Colorado, he envisioned a life unearthing dusty relics à la Indiana Jones. Instead he moved to North Carolina and immersed himself in the state's outstanding burial ground of lost ships, schooners and barks. Deep in the soundproof world of the sea, among the shards of colored pottery and antique glass, Lawrence found well-preserved slices of history as fascinating as any terrestrial discovery.

"Ships are intriguing because they represent the most advanced technology of their time period," says Lawrence, who has spent the past 20 years exploring the state's Atlantic graveyard as head of the Underwater Archaeology Unit of the N.C. Division of Archives and History. North Carolina boasts one of the strongest efforts to preserve shipwrecks among coastal states.

That commitment is evident in the unit and its staff of five full-time workers — "and the fact we've been at it for over 30 years," says Lawrence. "If you look at the remains that end up on the beach, (debris findings) happen everywhere along the Atlantic Coast,

but I don't think anywhere with the frequency that we have here."

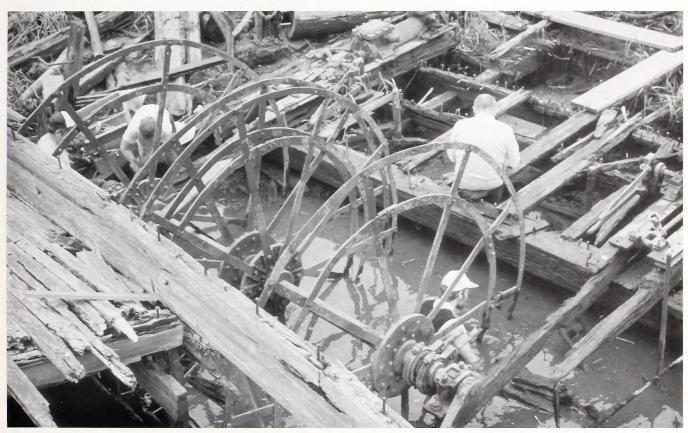
Lawrence and others are working to showcase North Carolina's spectacular untapped shipwreck graveyard while striving to keep it unspoiled.

The potentially destructive mix of technology and tourism has fueled

fears the few "ship strippers" will pluck away the remains of important vessels.

"They'll all be found eventually," he says. "Ships can't run and hide."

The challenge, however, is to balance regulation with education to save the invaluable aquatic time capsules.



Richard Lawrence (bottom right) and staff of the Underwater Archaeology Unit remove steam machinery from the late 19th century steamer H.G. Wright on the Cape Fear River. The restored machinery is now on display at the Cape Fear Museum.

debate about how to protect shipwrecks. Scientists worry that tourists, armed with modern exploration devices, will destroy invaluable sources of historical data. Even if scientists locate lost shipwrecks before hard-core treasure hunters do, museums and universities don't have the resources to remove the remains of every lost vessel.

John Halsey, a Michigan archaeologist who has headed efforts to preserve wrecks in the Great Lakes. laments the past destruction of wrecks. sometimes unintentional.

Most divers respect regulation, and many have spearheaded efforts to protect shipwrecks, Halsey says. But he

"People think, 'If I don't take it, somebody else will," Halsey says. "That's the most pernicious thing we have to deal with. But we can't take up everything that might be stolen. We don't have the money, and we don't have room."

The answer, he says, is simple: Leave it where it is.

Shipwreck protection has become a big issue in Michigan, where 40 percent of the state's territory is actually bottomlands.

At Fort Fisher, Lawrence is working on a project to study seven nearby shipwrecks and create a public

Continued

historical exhibit within two years. The project is co-sponsored by the National Park Service and East Carolina University.

Fort Fisher already claims a oneroom exhibit of colorful shipwreck history. The mini-museum is visited by about 80,000 people each year. Abandoned Shipwreck Act made individual states responsible for managing shipwrecks that have significance to American history, architecture, archaeology and culture. It also encouraged states to create marine parks where important ecological and historical resources can be

At some point, you no longer feel pain. Sensation disappears and reason is dulled. until you lose all grasp of time and place. Face down in the raft, with my arms resting on the gunwale and my beard on my arms, I felt the sun's merciless bite. For hours the air was filled with luminous spots. Finally exhausted, I closed my eyes. but then the sun no longer burned my body. I was neither hungry nor thirsty. I felt nothing, other than complete indifference to life or death. I thought I was dying. And that thought filled me with a strange, dim hope.

> Gabriel Garcia Marquez, "The Story of a Shipwrecked Sailor"



Unidentified shipwreck, Hatteras Island

Some breeze through in a few minutes; others pore over each photograph and wreck display. They follow North Carolina's underwater history — from prehistoric dugout canoes to the 1973 discovery of the *USS Monitor*.

"We pack a lot into that little space," Lawrence says. "But at whatever level you're looking at it, you can get something out of it."

The movement to turn shipwrecks into protected tourist sites is an international trend, says Kevin Foster of the National Park Service. The three most visited tourist spots in Northern Europe are remains of shipwrecks, he notes. Underwater archaeological sites have become the basis of the economy in some coastal communities.

While generating tourist dollars, managed sites also put the brakes on looting.

"The protection of underwater archaeological sites, just like other sites, will get better," he says. "Laws will see to that."

On a national level, the 1987

preserved and protected. By law, North Carolina has title to all abandoned shipwrecks within its territorial waters that have lain unclaimed for 10 years or more.

Divers are free to explore most sites without a permit inside North Carolina's territorial waters, which stretch three miles beyond the coast. The exception is the Monitor National Marine Sanctuary, off Cape Hatteras, where a permit is required. There lie the remains of the most famous Civil War vessel, which sank in a storm December 1862 near Cape Hatteras. Sixteen men died when the *Monitor* went down — some trapped inside the vessel and others swept away by the tempest.

It's illegal to disturb or remove material on any site without a permit. To remove an artifact, divers must convince officials that it will benefit the state in some way.

The vast majority of diving takes place outside the three-mile limit, primarily on World War II wrecks, where visibility is better. As Stick

Important North Carolina Shipwrecks

Note: Descending on a deepwater wreck, such as the Monitor, can be dangerous. Divers interested in exploring North Carolina's shipwrecks should first consult qualified diving professionals.

· USS Huron

Sunk in 1877, the USS Huron is North Carolina's only Historic Shipwreck Preserve. More than 100 people died when the ship sank in a storm. The vessel, which lies 250 yards from the beach, draws divers and snorkelers to Nags Head during the summer. Some parts of the ship have eroded, but the lower hull and portions of the bow remain intact. The ship's huge propeller and rudder remain, as well as boilers and cannonball storage racks. The shifting sands of North Carolina's shoals continually cover and uncover different parts of the ship.

· The Ironclad Monitor

After a brief career in combat, the Civil War blockade runner sank in an 1862 tempest. In 1973, the Monitor was finally located near Cape Hatteras by a team of scientists from the National Science Foundation, the National Geographic Society, Duke University, the Massachusetts Institute of Technology and the University of Delaware. Sophisticated electronic technology was needed to locate and identify the ship, which rested 230 feet below the ocean's surface. Divers need permits to visit the statemanaged site. Most of the artifacts recovered from the Monitor were moved to the Mariners' Museum in Newport News, Va.

• USS Atlas

In 1942, the USS Atlas met a fiery fate after being sunk by a German submarine near Cape Lookout. The tanker carried a crew of 34 men, most

of whom escaped to Morehead City in lifeboats after the attack. Two were lost in the flames that erupted around the oil-fired steamship. Today the wreck remains largely intact, with the hull and bulkheads still standing.

Remains of both U.S. and German vessels scatter the ocean floor off North Carolina's coast, reminders of the submarine warfare that marked World War I and World War II. By the time the United States declared war on Germany on April 6, 1917, a German merchant submarine had already proven its trans-Atlantic capability. In World War II, during the first six months of 1942, German U-boats perused the coast freely until the United States developed effective antisubmarine defenses.

points out in his book, about 90 vessels were sunk off the Carolina coast during the war — not including an undetermined number of German submarines.

"Of these, better than two-thirds were sunk by Nazi raiders, the remainder going down as the result of striking mines, stranding or foundering at sea," he writes.

In 1970, Stick and the National Geographic Society studied North Carolina's waters and pinpointed many of the wrecks. But most state bottomlands remain unsurveyed for submerged archaeological sites, according to the N.C. Division of Archives and History.

So far, the archaeological unit has documented about 700 vessels, ranging from prehistoric dugout canoes to Civil War era steamboats to 20th century ships.

The USS Huron underwater preserve opened in 1991. When a storm ravaged the Huron on Nov. 24, 1877, more than 100 people lost their lives. The ship was en route from New York to Key West, Fla., when it was caught in the squalls of a North Carolina coastal storm. Although the ship's captain was a seasoned navigator, he failed to obey a popular sailing maxim of the day: Never set sail on a Friday. Many people at the time thought this oversight led to the ship's demise, Stick writes. Resting just 250 yards from the beach, the wreck now draws curious divers and swimmers to Nags Head.

Recreational divers have often been the first to recognize the historical value of shipwrecks and organize efforts to protect them.

Gordon Watts, a maritime historian at East Carolina University,

compares tourism's effects on shipwrecks to those on national parks such as Yellowstone. "You have a tremendous natural area and if the public's going to appreciate it, they're going to have an impact on it. That's the same thing that happens with shipwrecks," Watts says.

Despite support from most divers for bringing wrecks under public management, some owners of charter dive operations have resisted the idea of publicly managing some of their most profitable spots. "But most people who run their own businesses realize it's in their best interest to preserve those shipwrecks," Watts says.

Divers should be required to learn about laws regarding underwater cultural sites when they are certified, Watts believes. "I think it's part of being a responsible diver," he says.

Standing

Women Speak for Commercial Watermen

Their Men

By Julie Ann Powers

Those who depend on the sounds and the seas for a living are encountering more unpredictable currents, treacherous waves and unfathomable depths.

But it's neither water nor weather that has left them so uncertain over their day's catch or their families' future. It's the widening world of fisheries regulation.

As North Carolina watermen contend with unprecedented government intervention, a new leadership has emerged in the quiet fishing villages that hug the coast. This growing force has come forth not from the decks and docks in these communities, but from the kitchen tables.

The wives, sisters, mothers and others related to commercial fishermen have banded together in organized advocacy groups. The organizations, some say, have given commercial fishermen an effective and unified voice in the political decision-making process for the first time.

"They bring to the table what's in the mind of the commercial watermen," says Jerry Schill, executive director of the N.C. Fisheries Association.

The three most active groups formed as auxiliaries under the association's wing. They speak only for commercial fishing families. The fisheries association represents the industry as a whole, with a membership



Twila Nelson

of commercial fishermen, seafood dealers and fish processors.

All three of the association's auxiliaries coalesced within a few months of one another in 1992 — Pamlico County in February, Carteret County in June and Hatteras-Ocracoke in October. A fourth began organizing in the northern Dare and Currituck county region this spring.

None formed in response to a single issue. They rose out of increasing frustration over actions by the state Division of Marine Fisheries and Marine Fisheries Commission, National Marine Fisheries Service, Atlantic States Marine Fisheries Commission, and other agencies and bodies promulgating catch quotas, size limits, closed areas, environmental protection measures, bycatch devices and safety standards.

Though the three began as women's groups and are often still perceived as such, the Carteret and Hatteras-Ocracoke auxiliaries are a mix of watermen and their wives. All the auxiliaries are led by women, however, and women bear the burden of most of the work.

Women have stepped forward to lead a traditionally male profession primarily for one reason — the demands of the commercial fishermen's work schedule. Workdays are determined by the whims of nature or the turn of the tides, not clocks and calendars.

"Fishermen fish," Schill says.
"There's no sense naming a fisherman
to a committee if he's not going to the
meeting. It's not like other industries
where you can take time off and make
it up later."

Some also say wives took charge because their husbands, even if they had the time, lack the temperament for public appearances, hearings testimony and committee meetings.

"My husband is just not inclined to do it," says Darleene Carawan of Aurora, president of the Pamlico auxiliary. "If he had wanted to be a public speaker

As North Carolina watermen

contend with unprecedented government intervention, a new leadership has emerged in the quiet fishing villages

that hug the coast.
This growing force has
come forth not from
the decks and docks
in these communities,
but from the kitchen tables.



The Hatteras group - Elizabeth Ainslie Struminski, Susan West and Crystal Blackmon

and a socialite, he'd never have gotten into commercial fishing. Most commercial fishermen are somewhat loners. Most of them are kind of shy. That's why they fit into that job. They don't want to be around a crowd of people."

This doesn't mean that commanding a microphone at contentious and crowded hearings comes easily to women accustomed to private lives in small towns.

"I'm not a public speaker," says Carawan. "It means enough to me that even though it makes me nervous and I get sick to my stomach sometimes, it's worth it."

Nor are the alliances always easy. Carawan says the label "commercial fisherman" is as ambiguous as "professional athlete," encompassing everyone from trawlers to crab potters.

"A basketball player can't go play football," she says. "A football player can't go play tennis. Commercial fishing is just that diversified, and people tend to throw them all together. Even in our auxiliary, we don't all always agree. One kind of fishing gets in the way of another."

Such differences, some speculate, played a large part in the downfall of past representation efforts, such as the defunct Carteret County Waterman's Association. The dormancy of an auxiliary of the Southeastern North Carolina Waterman's Association, formed four years ago, is in part blamed on inner conflicts.

So far, the success of the N.C. Fisheries Association auxiliaries has been in part due to their determination not to be split by the often divisive issues they face.

"They try to avoid pitting one fisherman against the other. They're trying to speak with one voice. They work toward issues that are good for the fishing industry as a whole," says Kathryn Zagzebski, a Duke University student in environmental management whose master's degree project focuses on the auxiliaries.

The auxiliaries are a true grassroots movement in which average citizens upset over government actions have inserted themselves into the decision process, she says. Members have to become politically savvy about how conclusions are reached, she says. That means using formal access points such as public hearings as well as networking, lobbying, media and personal contacts that sometimes hold as much sway.

"They go to public hearings and they write up commentary," Zagzebski says. "But they've recognized the importance of covering these informal channels as well."

Similar organizations have been in place in the Northeast and Pacific Northwest for some time, mostly in response to heavy regulation in those areas. The Pamlico auxiliary had a predecessor in the early 1980s that focused on inlet maintenance, then became inactive.

Zagzebski found in her research that the three active North Carolina auxiliaries have developed specialties.

The Pamlico auxiliary is noted for raising money channeled toward an annual trip to Washington, D.C., to lobby Congress and toward the main fisheries association. The Pamlico group retains a mostly female membership.

Carteret and Hatteras-Ocracoke have many fisherman members. The Carteret auxiliary has a reputation for meticulous research on fisheries issues. The far-flung Hatteras-Ocracoke group is

Continued

The wives, sisters, mothers

and others related to commercial fishermen have banded together in organized advocacy groups. The organizations, some say, have given commercial

fishermen an effective and unified voice in the political decision-making process for the first time.

noted for its letter-writing campaigns.

The auxiliaries have brought fishing communities closer together, Zagzebski says, and have provided fishermen and their families a chance to vent frustrations in a familiar place among familiar faces.

They've worked at improving the public image of commercial fishing. And they've become important information networks within their communities and information sources for policy-makers and the public on complicated issues. They have also, in many instances, become interpreters between decision-makers and fishermen.

"They translate fishing jargon into political jargon and vice versa," Zagzebski says. "It's a completely different language that each speaks."

Their presence in the political process seems firmly established. Auxiliary presidents sit on the board of the fisheries association. The auxiliaries have brought a surge of new members and financial stability to their parent organization.

Some members are citizen advisors to the state Marine Fisheries Division; others are on significant committees, such as the one guiding research on the current commercial fishing license moratorium. Rules governing the state Marine Fisheries Commission have been rewritten to allow seats designated for commercial fishermen to be filled by spouses.

And decision-makers listen to them.

"The auxiliaries have become the groups that I truly rely on for accurate information and absolute positions on issues," says state Sen. Beverly Perdue of New Bern. "They are at the top of the list when I have something involving



Darleene Carawan

fisheries that I need advice and direction on. They're available, they're well-schooled and they're very honest.

"Sometimes they make choices and articulate positions that are not for the good of their own families but for the good of the fisheries, and I admire them for that," Perdue says.

Fishermen themselves have been impressed.

"We wouldn't know half what's going on," if the Carteret auxiliary didn't exist, says Clinton Willis, a Marshallberg fisherman. "We wouldn't have anybody representing us." Willis is particularly appreciative of the time and patience the regulatory meetings demand. He once led the Carteret County Waterman's Association.

"It takes you being there and people getting used to you," he says. "If you're honest and truthful with them, they'll put a little more credibility on you."

That the speakers are women has a pronounced impact.

"If a fisherman gets up at a meeting and talks, the regulation is just affecting a single individual, a single businessman," says Zagzebski. "But if his wife gets up at a meeting and

testifies, it really shows the policymakers and people there that they're not only affecting an individual, they're affecting an entire family, an entire community, an entire way of life."

That is a difficult image to counter, says Dick Brame, executive director of the Atlantic Coast Conservation Association. The organization of recreational saltwater fishermen is frequently on the opposite side of commercial watermen in regulatory tussles.

"One of the problems you have in all these fisheries arguments is you've got numbers and you've got faces," Brame says. "They've got faces. It's emotional. They've got kids. 'My husband can't be here, and I'm here, and you're taking money out of his pocket.' That kind of stuff. That will always win over any data in a public meeting, regulatory type of thing."

Brame has brought on the ire of the auxiliaries with his stand that commercial fishing is a business, not a way of life, and it should be treated as such in resource allocation discussions.

The clash has become so heated, he says, he has declined to speak at public hearings where the auxiliaries are

Scott D. T.

represented. For better or worse, the auxiliaries have become part of the regulatory process, he says.

"I think they have a legitimate place, and they have every right to have their viewpoint expressed," he says. "There's no question they have an effect. They let their views be known. Because they formed a group, they are automatically more or less in the system."

Though their presence may represent strong sentiment, the auxiliaries try to take a methodical and organized approach. True to her group's reputation as researchers, Twila Nelson, president of the Carteret auxiliary, has been combing tax records to find out how many commercial boats are registered and how much money commercial fishing means to her county.

She fears that a move to ban almost all commercial nets off the coast of Florida will migrate to North Carolina.

"We're trying to stay a step ahead," she says.

The desire for accurate information used in decision-making was central to the group's formation, says its secretary Mildred Gilgo, whose family has fished for generations.

"We wanted data-based decisions rather than propaganda and hostility," she says. "We look for the truth because the truth never hurt a fisherman. We try to research. We try not to go on emotion. We try to go on facts. We try to do things in a logical, commonsense way."

That doesn't mean the issues aren't emotional for the participants. "It's our livelihood," Gilgo says. "It's our culture."

The auxiliaries' calm, systematic presentations have been a departure from the past performances of some of their constituents.

"Fishermen have a reputation of just kind of jumping up and down at public hearings and saying, 'Y'all can't do this to me," says Barbara Garrity-Blake, an anthropologist and a member of the Carteret auxiliary who lives in Gloucester. "The women have really been requesting accountability from policy-makers. Not just, 'You can't do this to us,' but 'What are you basing these policies on? Can we see the data? Where is this coming from?'

"That's been a very effective approach," she says.

Garrity-Blake was moved to join the auxiliary after conducting her doctoral research on the menhaden industry. "I wanted to give something back," she says. "I live here. I was concerned about what was going on."

The auxiliaries, she says, are attempting to catch up with their political adversaries. Sportfishing organizations are "extremely organized, very well-connected politically and have a lot of money backing them," she says. "They know how the game works."

The work is demanding and frustrating, she says.

"Fishermen are notorious for having a hard time organizing. They're a hard group to help because they're so independent, so autonomous," says Garrity-Blake.

And trying to voice concerns to a bureaucracy can be like shouting into the wind.

"This is a very intense endeavor," she says. "The auxiliaries have made a lot of forward steps but no great big, giant victories. So people get discouraged, and there's a high burnout rate."

All the auxiliaries have a tough time holding members and sharing tasks. Pamlico and Carteret each count about 35 paid members, and Hatteras-Ocracoke, about 100. The volume of work falls on the shoulders of a few.

Auxiliary members add long drives, meetings, countless phone calls, tedious research and other activities to lives already full with jobs, families and community obligations. Their routines are made even more complex by their husbands' unpredictable schedules.

Susan West, president of the Hatteras-Ocracoke group, says auxiliary work is never-ending and all-consuming.

"The responsibility I feel to the auxiliary, I put that before a lot of other things that used to be important to me. I let all those other things slide," she says. "Some days it seems like it's worthwhile. And other days I look at how dirty my house is, and the fact that we don't have regular cooked meals as often as we used to before all this started, and I think, jeepers, this is rough.

"It's kind of bizarre how our lives have changed," West says. "At our last auxiliary meeting, we talked about politicians the way we used to gossip about people we actually knew."

The groups resent that a profession once viewed as an admirable part of the state's heritage is now attacked as an exploiter of the environment. Adding to the frustration is the sense that changes have been sudden and severe.

"Ten years ago, you had hopes for your future and goals," says Crystal Blackmon of the Hatteras-Ocracoke auxiliary. "Now you're scared to buy a new automobile."

They have had some small successes. A proposed total ban on weakfish last year was amended to a closure for one day a week. Still, the work sometimes seems overwhelming.

"I decided the auxiliary was too much a long time ago," says Elizabeth Ainslie Struminski, who lives on Hatteras Island and belongs to the auxiliary there. "Our lives are pretty much taken up with it. But you have to keep going. You have to try."

Her dream, says Struminski, is that the auxiliary would have no reason to exist, that there would be no public policy issues to be forged or public relations battles to be fought.

"We could disband and not have to do any of this," she says. "Our husbands could just get up in the morning and go to work."

But that scenario will likely remain only in memory and in fantasy, says Schill of the fisheries association.

"If there is to be a future for commercial fishing families," he says, "it will only be there with the maintaining and growing of the auxiliaries."

Habits & Habitats

By Kathy Hart

In salt marshes from Cape Cod to Texas lives a reptile of distinction.

At the turn of the century, the diamondback terrapin was the catch of the day in the culinary world. Its meat was lavishly prepared into a soup that graced the tables of America's nouveau riche. In fact, turtle soup became so popular that wild populations of this heralded terrapin dropped dangerously low and prices for the reptilian harvest skyrocketed to \$125 a dozen by 1920.

The government even established a hatchery, which was located on Pivers Island near Beaufort. Opened in 1913, the hatchery released more than a quarter of a million young turtles into the salt marshes along the East Coast before it closed in the late 1930s. But no one knows how well the farm-raised hatchlings survived after release.

Populations did rebound. It's more likely, however, that a combination of events — the Depression, World War II and the terrapin's own high cost and scarcity — led to its disappearance from the dinner table and a renewed chance for survival in the estuary.

In North Carolina, the diamondback terrapin has been designated a species of special concern by the N.C. Wildlife Resources Commission. But no regulations restrict its harvest.

The reptiles are not uncommon in Tar Heel estuaries. Often they are heard rather than seen as they paddle among the salt marsh grasses. The terrapin's powerful jaws pop as they snap down on their favorite meal — periwinkle snails.

Female diamondback terrapins reach a maximum length of about 9 inches. Males are smaller, seldom more than 5 inches long. Females also have distinctively larger and flatter heads, deeper shells and shorter tails than males. Some diamondbacks are distinguished by a debonair mustachelike marking on the upper jaw.

The terrapin's upper shell may be gray, brown, olive or black. It's often marked by a distinctive pattern of dark and light concentric circles. Its head and legs range from light to dark gray with darker spots. The hind legs are large; the feet, webbed, making the terrapins powerful swimmers.

In the spring, diamondback terrapins emerge from winter hibernation spent buried in the mud of tidal creeks or salt marshes. Sexually mature adults mate in March and April. The smaller male can be seen clinging to the back of the larger female during the courtship ritual.

Nesting occurs from April through July. The female diamond-back searches for a site to lay her eggs, sometimes traveling more than a mile from her aquatic home. The reptilian mother lays her eggs during the day, usually at high tide on marsh islands, coastal dunes and road embankments.

As development has encroached on habitat, nesting sites are often separated from marshes by roadways, which can mean death to the slowmoving terrapins. Along Georgia's barrier islands, turtle-crossing signs caution motorists to watch for the eggbearing mothers.

After testing the sand with her snout, a mother turtle will dig her nest in the sand with first her front feet, then her hind ones. She will drop four to 18 pinkish-white, leathery eggs into the flask-shaped nest, then cover it with sand and leave.

Unfortunately, the mother diamondback terrapin is rarely alone in her sandy delivery room. Gulls and crows roam overhead or perch on nearby tree limbs waiting for an opportunity to feast on the newly laid eggs. Gulls will snatch the eggs as they are laid; crows dig up the eggs after the mother has finished her labor.

Gulls and crows are daytime predators. At night, foxes and raccoons raid the nests for a midnight snack. Some researchers estimate that 50 percent to 75 percent of the diamondback terrapin nests are destroyed each season by natural predators.

The hatchlings are also vulnerable to predation. In one study, herpetologists found that 22 percent of the hatched turtles were killed by predators. Even as adults, the terrapins are eaten by raccoons. It's a small wonder that any of the turtles reach their life expectancy of more than 40 years.

Terrapin eggs incubate 50 to 100 days before hatching. Temperature determines the length of the incubation period and the terrapin's gender. Warmer temperatures yield more females, and cooler temperatures result in more males.

Once diamondback terrapins hatch and travel to the estuary, a

mystery begins. Young terrapins between hatching and reaching sexual maturity at three to four years virtually disappear into the vast expanses of salt marsh. No one knows where they go. One Delaware researcher found small numbers of the youngsters hidden beneath the wrack of dead reeds pushed up by the tide at the marsh edge.

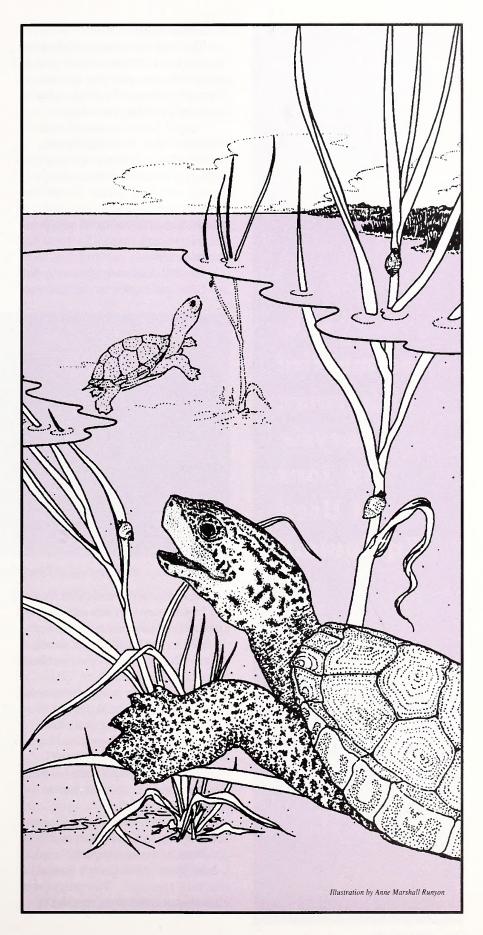
Could it be the small terrapins hide among this marsh camouflage, protected from predation, and feed on a smorgasbord of estuarine invertebrates? Perhaps. But until biologists focus more research on these estuarine terrapins, no definitive answer is forthcoming.

Last August, herpetologists and resource managers from the Atlantic and Gulf states gathered at the Savannah River Ecology Laboratory in South Carolina to discuss the ecology, status and conservation of the diamondback terrapin. Their concern was that this estuarine reptile was again on the decline in many states.

Researchers cited habitat loss, water quality degradation, road kills and incidental entrapment in crab pots as contributing factors to the terrapin's possible reduction in numbers. But without comprehensive population data, the researchers and resource managers could make no definitive statements about its status or any recommendations about its inclusion as a species of concern under the U.S. Endangered Species Act.

Why study the diamondback terrapin? Like the canary in the coal mine, diamondback terrapin populations are indicators for the health of the environment, particularly salt marshes. The turtle is part of a complex estuarine food web that is carefully balanced from bottom to top among a variety of plants and animals.

And who among us doesn't delight at the sound of the diamondback feeding on periwinkle snails or the sight of the terrapin sunning on a marsh bank? As with all creatures, there is value in just knowing it's there.





By Carla Burgess

The state's commercial fishermen recycled nearly 22 tons of crab pots and nets in February, attacking a waste disposal problem and setting a good environmental example to boot.

Coastal fishermen carried trash from their trade — old shrimp and flounder nets and worn-out crab pots to 17 drop-off sites in nine counties during a two-week period. By the time the collection had ended, they had squashed and stacked 4,600 crab pots and shed enough net to fill several tractor trailers.

The effort was coordinated by N.C. Sea Grant and funded by the National

caring fishermen out there who are good stewards of our public resources."

An indispensable partner in the project was the state's Office of Waste Reduction, which coordinated removal of the waste material and its recycling.

"We're after reducing the waste stream going into the landfill ... (and) it makes sense to promote not throwing them (nets and pots) back into the water," says Gerry Sutton, waste management analyst with the Office of Waste Reduction. His agency has already devised similar solutions for farmers by collecting and recycling plastic containers that once held pesticides and other chemicals. "A



Crab pots stacked at drop-off at South Creek, Etles Henries Seafood

Marine Fisheries Service (NMFS). Until this first-time project was arranged, old crab pots and other useless gear were destined for the landfill — or worse, illegally dumped along tidal creekbanks or into coastal waters.

"There's really nothing that looks worse than a bunch of rusted-out, stomped crab pots lying along the shore," says Tyrrell County crabber Willie Phillips. He says it's time fishermen began to tackle their waste disposal problems and polish their public image as well.

"There are perceptions that people in the fishing industry aren't taking good care of the environment," says Lundie Spence, Sea Grant's marine education specialist. "This project was clear evidence that there are a lot of

couple of years ago, we had problems within the agricultural community of dumped chemical containers. Stuff ended up in the woods."

Weighing in at 20 tons, crab pots accounted for the bulk of the material. With an estimated quarter of a million discarded pots entering the state's waste stream each year, crab pots present a bigger disposal problem than nets. In North Carolina and other Southeastern states, fishermen rigorously reuse their nets. The fish net material, including nylon, polyethylene, polypropylene and monofilament, made up only a fraction of the collection by weight - 3,500 pounds.

The nets were baled at the East Carolina Vocational Center in Greenville and marketed overseas.

The steel pots — galvanized, vinyldipped and uncoated — all went into the pile for meltdown and reuse by local scrap steel dealers.

This project diverted a small percentage of gear overall, but it was a promising beginning. Local fish houses, seafood dealers, a netmaker and other community businesses volunteered space on their properties for drop-off sites. Local waste haulers donated their services. Sea Grant staff coordinated logistics and publicity. A fishing association — the N.C. Crabbers League of Aware Watermen (CLAW) — also helped get the word out. Most of the participants expressed

1990, says Fran Recht, manager of habitat education for the Pacific States Marine Fisheries Commission. Not to mention the tons of metal and cardboard recycled at many Northwest ports each year and the wood and nets made available for reuse.

The effort to collect gear in the Northwest began in 1987 in Newport, Ore., with financial support from NMFS and direction by Recht. It has continued in other ports of Alaska and Washington. Nylon nets from Cordova, Alaska, and surrounding ports in the region are baled and marketed overseas, where they are melted down and become bicycle seats, auto parts, kitchen



Sea Grant agent Bob Hines inspects webbing collected in Oriental.

a strong desire to continue the program next year.

"A lot of people hadn't been aware of it early enough this year," says Phillips. "Now that there is a history, people will be thinking ahead and waiting for the pickup times to roll around again, and participation will just get better and better."

Sea Grant is planning a summer meeting to assess the strengths and weaknesses of the program and to plan for 1996.

The collection and recycling of fishing gear has become business as usual in other regions of the country. In the more centralized ports of the Northwestern United States, close to 300,000 pounds of nylon fishing nets have been collected and recycled since

utensils and electronic components.

NMFS assists between 15 and 20 U.S. fishing ports in similar efforts, including areas of the Gulf and the Northeast, says James Coe, director of NMFS' Marine Entanglement Research Program, which also functions as the marine debris program of the National Oceanic and Atmospheric Administration.

The emphasis on marine debris stemmed from the entanglement of marine mammals in stray nets and other plastics dumped or lost in the water, Coe says. "But it was also from some concern over birds, lobsters and crabs and the problems associated with ghost fishing and destruction of a living resource.

"Early on, it became clear that if

the fishing industry was going to be returning refuse to port for disposal, it was going to have to have a place to put it," says Coe. "We wanted to help the ports and the fishermen work together to deal with this problem."

Coordinators have successfully nurtured programs throughout the country that have taken on a life of their own.

"They seem to be able to continue to operate even after the initial voluntary thrill is gone," Coe says. "But it takes some dedicated people, and it takes some money. This is not a flash in the pan. It's a necessary adjustment toward more sustainable resource and coastal zone management."

Coordination was difficult among the small ports and docks scattered along North Carolina's numerous creeks and estuaries. But it appears that the fishermen, community businesses and agencies involved in this first attempt are encouraged enough to keep on plugging.

Businesses that participated as collection sites included Hopkins Seafood, Belhaven; Etles Henries Seafood, South Creek: Luther Smith & Son Seafood, Atlantic; South River Seafood and Thomas Seafood, Beaufort: Nixon Seafood, Edenton: Currituck Crab, Currituck; Colington Crab, Colington; Trinity Seafood, Stumpy Point; Wanchese Seafood Park, Wanchese; Johnson Fishery, Engelhard; Jarvis Seafood, Swan Quarter: New River Net Co., Sneads Ferry; Jack Williams' Crab House, Arapahoe; R.E. Mayo Co. Inc., Hobucken; and Garland Fulcher Seafood Co. Inc., Oriental.

A slate of local waste haulers also teamed up to make the effort possible. They included: Waste Industries Inc., Newport and Elizabeth City; Smithton Sanitation Inc., Washington; BFI Inc., Kinston; Reliable Disposal, Edenton; Dare County Public Works, Manteo; Waste Management of Hampton Roads, Chesapeake, Va.; American Refuse System Inc., New Bern; Albemarle Solid Waste Authority, Belvidere; and Coastal Regional Solid Waste Authority, New Bern.

Limited Entry Conference

Who will be allowed to fish? What kind of gear can be used? How many fish will fishermen be allowed to catch? These are questions that North Carolina's fisheries policymakers may address in the future. But before they're answered, speakers at the North Carolina Limited Entry Conference, to be held this June in New Bern, will explain the options.

Limiting entry or access to fisheries is a possible management option in North Carolina.

"As new fishery policies are considered, it's important that policy-makers, industry leaders, fisheries managers and the concerned public understand the potential use of limited entry programs," says Jim Murray, the director of N.C. Sea Grant's Marine Advisory Service. "The purpose of this conference is to educate and inform."

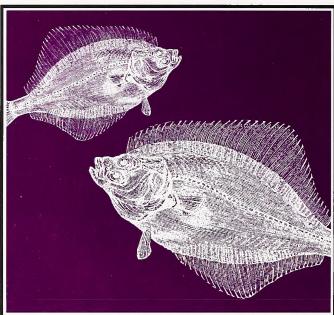
The conference features speakers such as Jerry Schill, executive director of the N.C. Fisheries Association; Miles Mackaness, a commercial fisherman; and Ben Muse, an economist with the Alaska Commercial Fisheries Entry Commission. Topics on the agenda include the international history and uses of limited entry, a panel discussion on its implications and firsthand experiences of limited entry programs in other areas of the United States.

The limited entry conference is sponsored by N.C. Sea Grant, N.C. Division of Marine Fisheries, Duke University, N.C. Fisheries Association, N.C. Crabbers League of Aware Watermen (CLAW) and others. It will be held Thursday, June 29, from 1 p.m. to 6 p.m., and Friday, June 30, from 8:30 a.m. to noon, at the Sheraton Grand in New Bern.

The registration fee, which includes an outdoor shrimp-a-roo, is \$35 before June 16 and \$45 afterward. For special room rates at the Sheraton, call 1-800/326-3745 and make reservations under the limited entry conference. The rate is \$75 for single and double rooms. For more information, call Murray at 919/515-2454.

Big Sweep Hires New Executive Director

Judy Bolin has been named the new executive director of N.C. Big Sweep, a nonprofit organization



dedicated to removing debris from the state's waterways. She succeeds Susan Bartholomew, who left the position for another career opportunity.

Bolin previously served as Big Sweep coordinator for Pamlico County, where she headed the Keep America Beautiful Program.

"Judy brings lots of cleanup and coordination experience to the job of executive director," says Kathy Hart, president of the Big Sweep board of directors. "She understands the issues involved and knows how important it is to tackle the problems of waterway debris through coordination, coopera-

tion and community involvement."

In the coming months, Bolin will be organizing the 1995 First Citizens Bank Big Sweep, which is set for Saturday, Sept. 16. If you would like to volunteer for the cleanup or be a site coordinator for a waterway in your county, call Bolin at 1-800/27-SWEEP.

Coastwatch Raises Subscription Prices

With paper costs skyrocketing and postal rates increasing, N.C. Sea Grant is forced to raise *Coastwatch*

subscription prices to cover its production costs.
Beginning June 1, a year's subscription to the magazine will cost \$15.

"We're sorry to have to raise our subscription fees," says managing editor Kathy Hart. "We've held the line as long as possible on production costs, but we simply can't absorb anymore increases without passing them on to our readers."

Coastwatch has maintained its \$12 subscription fee since it moved from a newsletter to a magazine format in May 1991. But in the last year, paper costs, postal rates and production

fees have escalated.

Coastwatch is subsidized by subscription fees and a federal grant from the National Sea Grant College Program. The magazine does not accept advertising.

"We feel it is inappropriate for a magazine published by a university-based program to accept advertising," Hart says. "We want *Coastwatch* to be a source of factual, balanced information, and we feel advertising might compromise Sea Grant's unbiased stance.

"We hope readers understand and will continue to subscribe," Hart says.

The River Red: A Workshop

Controlling erosion and sedimentation is of paramount interest in coastal North Carolina. A July workshop in Brunswick County will focus on the topic and address ways that landowners, landscape contractors, builders and developers can maintain the environmental balance without excessive expense.

"The River Red: An Erosion and Sedimentation Control Workshop" is scheduled for July 21 at Brunswick Community College in Leland. It is sponsored by N.C. Sea Grant; N.C. Cooperative Extension Service; N.C. State University; N.C. Division of Land Resources, Land Quality Section; N.C. Coastal Federation; and Brunswick Community College.

The workshop will feature a slate of environmental and plant experts who will discuss the regulations governing erosion control, methods to prevent erosion and sedimentation, and ways to mediate sedimentation or erosion problems.

Following is the workshop schedule and speakers:

8:30 a.m. Registration 8:45 a.m. Introduction

Moderators:
Milton Coleman,
director, Brunswick
County Cooperative
Extension Service
and Joe Zublena,
N.C. Cooperative
Extension Service

9 a.m. "Why be concerned about sedimentation and erosion?"

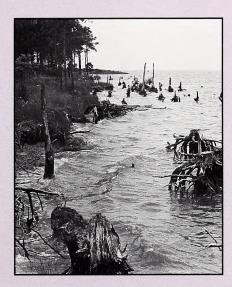
Larry Cahoon, professor, Biology Department,

University of North Carolina at Wilmington

9:30 a.m. "Regulations, permits and rules governing land clearing and revegetation."

Catherine McCracker

Catherine McCracken, public policy specialist, N.C. Cooperative Extension Service



10 a.m. "Real world issues facing developers and builders."

Samuel Ballou,
SF Construction Co.,
Morehead City

10:30 a.m. Break and refreshments

10:45 a.m. "Erosion control on large disturbed sites during construction."

Craig Deal, David Ward and Toby Vinson, N.C.

Division of Land Resources, Land Quality Section

11:15 a.m. "Erosion control on small disturbed sites during construction."

Greg Jennings, extension specialist, Department of Biological and

Agricultural Engineering, N.C. State University

11:30 a.m. "Revegetation of wetland sites."

Steve Broome, professor, Soil
Science Department, N.C. State University

11:55 a.m. "Revegetation of upland sites."

Bruce Williams, area specialized agent,
N.C. Cooperative
Extension Service

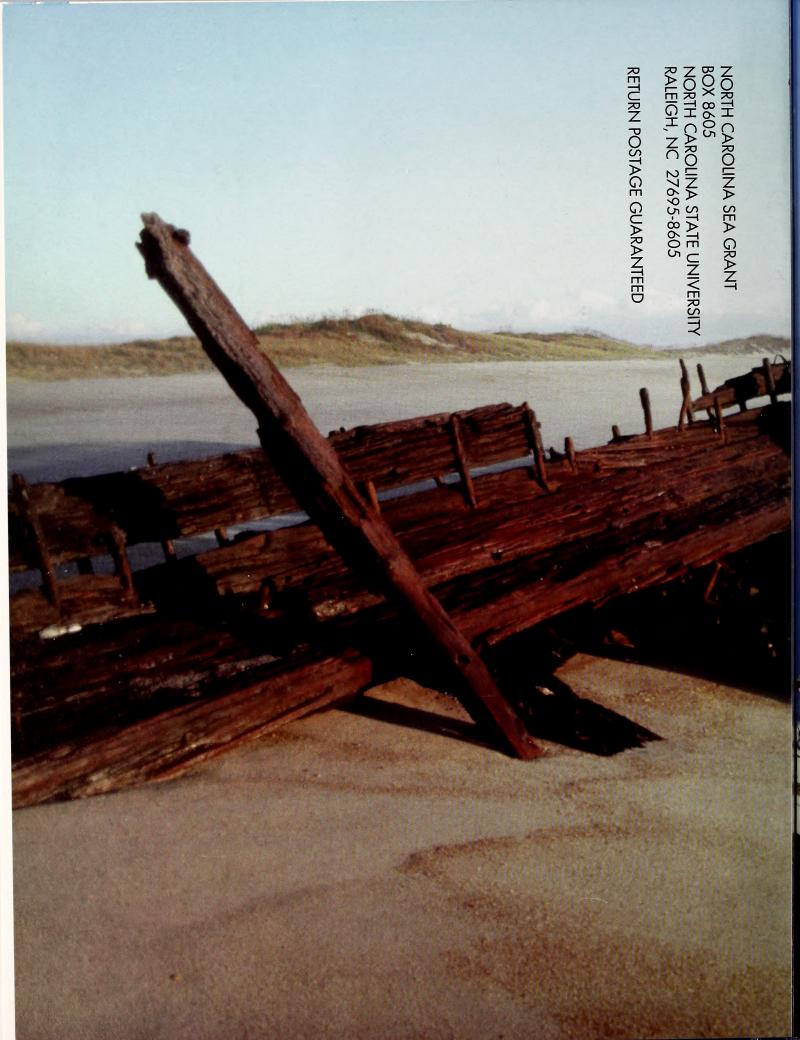
12:15 p.m. Working lunch Speaker to be announced

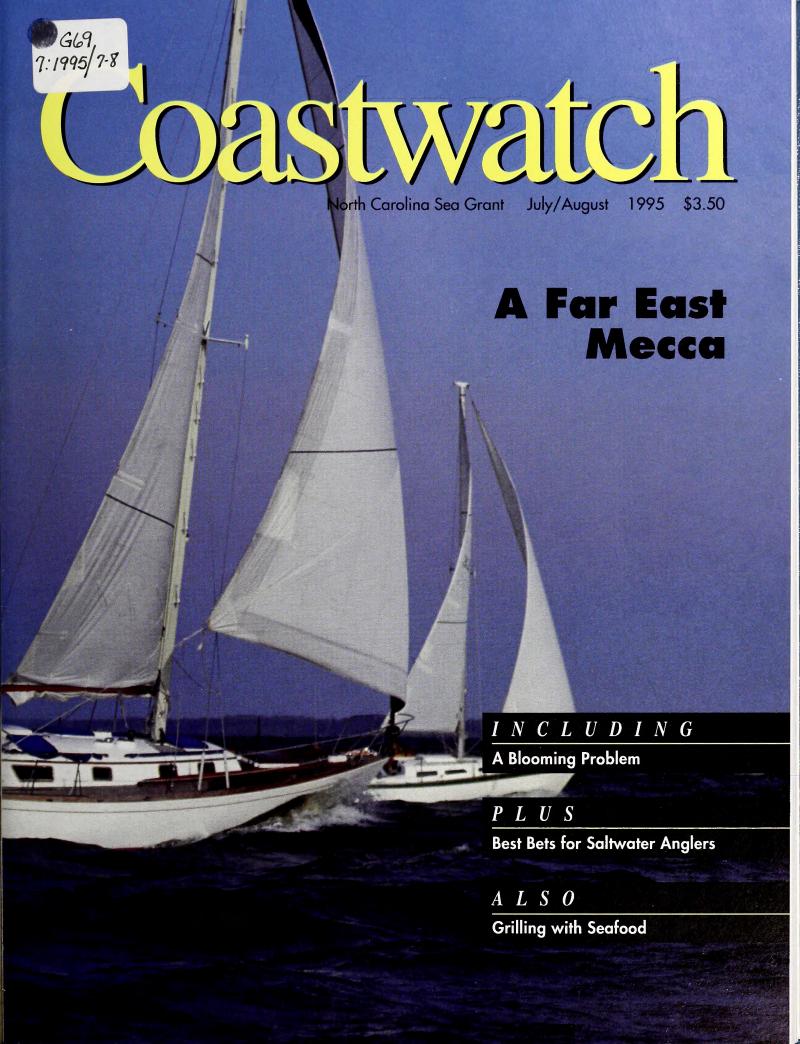
1 p.m. Issue identification
Moderators:
Milton Coleman,
David Nash and
Sandra Maddox,
N.C. Cooperative
Extension Service

2 p.m. Tour of erosion-control sites
Tour leaders:
Phil Ricks and
David Barkley,
New Hanover
County Cooperative
Extension Service

4 p.m. Return to Leland
Branch of Brunswick
Community College

Registration is \$15 per person. To register, send check payable to Brunswick IPM by July 14 to: Erosion and Sediment Control Workshop, N.C. Cooperative Extension Service, P.O. Box 109, Bolivia, NC 28422. Please include your name, affiliation, mailing address and phone number. For more information, call Bruce Williams at 910/253-4425. Fax number: 910/253-7248.





Coastwatch Staff:

Kathy Hart, Managing Editor
Jeannie Faris and Carla Burgess,
Senior Editors
Larisa Tatge and Rachel Wharton,
Staff Writers
L. Noble, Designer
Sandra Harris, Circulation Manager

The North Carolina Sea Grant College Program is a federal/state program that promotes the wise use of our coastal and marine resources through research, extension and education. It joined the National Sea Grant College Network in 1970 as an institutional program. Six years later, it was designated a Sea Grant College. Today, N.C. Sea Grant supports several research projects, a 12-member extension program and a communications staff. B.J. Copeland is director. The program is funded by the U.S. Department of Commerce's National Oceanic and Atmospheric Administration and the state through the University of North Carolina.

Coastwatch (ISSN 1068-784X) is published bimonthly, six times a year, for \$15 by the North Carolina Sea Grant College Program, Box 8605, N.C. State University, Raleigh, NC 27695-8605. Telephone: 919/515-2454. Fax: 919/515-7095. E-mail: k_hart@ncsu.edu. Second-Class Postage paid at Raleigh, N.C.

POSTMASTER: Send address changes to *Coastwatch*, N.C. Sea Grant, Box 8605, N.C. State University, Raleigh, NC 27695-8605.

Front cover photo of sailboats near Oriental, N.C., by Scott D. Taylor.

Inside front cover photo of Heterocapsa dinoflagellates.

Printed on recycled paper by Highland Press Inc. in Fayetteville, N.C.







Page 2



Page 10

Page 14

Features

Oriental: Small-Town Charm and Smooth Sailing

High-Tech Tools Track River's Health

Best Bets for Saltwater Fishing

Each year, thousands of recreational fishermen try their luck in North Carolina's estuaries and coastal waters. Some track a particular species; some pursue world records; some are catching dinner. They use simple bait and tackle, charter boats outfitted with high-tech equipment and a variety of techniques. This summer, *Coastwatch* outlines what North Carolina fishermen have in common — 12 species most likely to be found at the end of the line.

Great Grills of Fire

Fire up the grill. It's summer. And there's nothing that tastes better than grilled seafood. Hot coals cook fish and shellfish quickly, lightly searing the outside while the interior

Life at the Waterworks

Close to 50 varieties of freshwater wetlands can be found within North Carolina's borders. Some are swampy and easy to identify; others are soggy at best and even dry during parts of the year. Their differences aside, each wetland type performs important natural functions — cleansing nearby waters, controlling flooding or providing habitat for many of the state's endangered and threatened species. A new exhibit at the N.C. State Museum of Natural Sciences explores the differences and functions of six types of freshwater wetlands.

Departments

N.C. DOCUMENTS CLEARINGHOUSE

AUG 15 1995

N.C. STATE LIBRARY



Photos by Scott D. Taylor



Inental

Small-Town Charm and Smooth Sailing

By Rachel Wharton

a Sunday afternoon in Oriental, things are quiet.

A few fellas gather in the Harbor Side Grocery, watching Kyle Petty race on a little television that sits above the produce. The windmills at Red Lee's Grill spin lazily, waiting for Monday when the regulars return to devour the 25-cent burgers.

Oaks and crape myrtles rustle at the Tar Heel Inn, which is virtually vacant. A few folks are about, watering lawns, admiring their impatiens, leaning against a railing and watching the Neuse River. On this calm day, a lone trawler chugs along, followed by a powerboat or two. In Raccoon Creek, the old town harbor, a sailor sits on his boat listening to rock and roll.

But on a windy day, look to the river. That's where he'll be, jibing and tacking.

Oriental is a sailing town. At least eight creeks meander through Oriental, located at the end of N.C. 55 in Pamlico County. The town is formed where five of them (Greens, Smith, Raccoon, Kershaw and Whitaker) meet at the Neuse — one of North Carolina's primary coastal rivers. From there, the Neuse flows miles wide into the Pamlico Sound.

With about 800 residents. Oriental has fewer people than sailboats.

Locals say 2,000 of the wind-

powered vessels float in the canals, marinas and slips that dot Oriental. Although that's not certified, a drive in most directions ends in an army of gleaming boats, their masts reaching to the clouds.

Most are from Oriental; some are from New York or even San Francisco. There's the *Hootenanny* and *Risky* Business, the Bets, Misbehavin', the Alibi and Duck Soup.

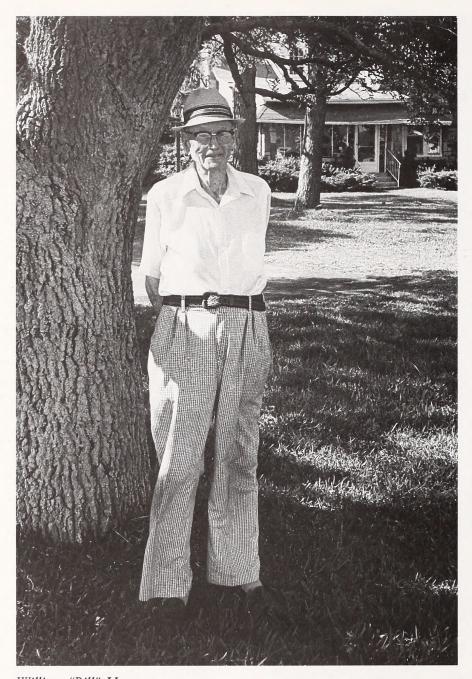
John and Madeline Sutter, who live on Whitaker Creek, sail the Madeline, a 38-foot Charles Morgan yawl. On blue, beautiful days, they wave to their neighbors, engage in informal drag races, appraise the new boats on the water and giggle at the less experienced sailors. They like a little stormy weather too.

"We don't choose it," says John, "but when it comes, it's exhilarating."

The Sutters moved from St. Louis, Mo., eight years ago. Like many of their neighbors, they retired in Oriental from bigger cities and different lives. Although they may enjoy the excitement of the wind and waves, they like the easygoing attitude of Oriental.

"Oriental's really a state of mind, not a geographical location," says Madeline. "Everybody welcomes you with open arms. It's just an amazing town. Where else can you ride down the street on a bicycle and not get run over?"

Continued



William "Bill" Mason

When you look at the boats and nice homes that come along with the sailors, you might forget Oriental is still a small town. There are no fast-food restaurants. No stoplights. The town hall and fire station share a building. To do serious shopping, see a movie or go to a chiropractor, you have to get in your car and drive about 30 minutes.

"You can go to New Bern and get what you need," says Larry Gwaltney, owner of Sail/Loft Realty Inc. in Oriental. "But when you come back, you leave all the crime and pressure and traffic back in New Bern."

Gwaltney, whose father founded Sail/Loft in 1976, grew up in New Bern and had relatives in Oriental. He moved here 11 years ago to take over the business. "In the first year here," Gwaltney says, "I made more friends than in the 15 years I spent in Asheville."

You can't talk to any of the "come-heres," or any of the "been-heres" either, before they start talking about the friendliness of the town.

"I crossed over the big bridge and immediately felt I was home," says Judy Bolin, who moved to Oriental after she discovered it on a trip.

"I can't explain it," she says.
"I've never felt that way before. I
think the people make a difference.
You'll notice that even if people don't
know you, they'll smile and wave."

Now, moving back to Raleigh years later, she's keeping her apartment with the bay window that looks out onto the Oriental harbor — a window that was originally the ticket booth of the train depot.

"Oriental is in a slower time," she says. "They keep up with things, but it's not a real major thing, a life-and-death situation. It's a laid-back, old-town kind of thing. In some ways, it's progressive."

People in Oriental leave their bikes sprawled on front lawns and the doors to their houses open. They sit and rock on the porch at Billy and Lucille Truitt's Ol' Store, where more knicks and knacks are for sale than sailboats on the river on a windy day. They visit, sometimes stopping the car in the road to talk for a while. Most don't have mailboxes. Instead they gather at the post office to pick up their mail and talk, a holdover from the days when the train delivered the mail.

But in a little town, isn't it easy to be restless, to become bored?

"Some people like it; some people don't," says a bicycler who stops to rest on the bridge into town from Minnesott Beach. "Some like big cities. They think there's nothing to do in Oriental but bike and read. I like to bike and read."

People are active, says Madeline. If they want to sing or see a play, then

they do it themselves. Oriental's own theater group, the Pelican Players, performs at the Pamlico County Cultural Center in the old town

And even those most likely to get big-city fever, the teen-agers, seem to adapt to it.

"Chapel Hill has the services, the academic atmosphere," says Paul Delamar, 18, who just finished his first year at the University of North Carolina at Chapel Hill. "Most of my friends say, 'Why would you want to go back?'

"It can hinder you a little bit," he says. "Everything in Oriental closes about 11 p.m. You have to drive 30 miles to do pretty much anything. But it can also be a tremendous advantage. You can go out and walk the town at midnight and be fairly sure nothing's going to happen to you."

A lot of people in Oriental do visit other places, go to college or even live somewhere else for a while. But almost always they come back.

"I traveled like you collect things," says William "Bill" Mason. "I collected counties and countries, but I still like Oriental better than anyplace in the world.

"I know everybody here," he says. "Everybody knows me. I feel like if I need a favor, I could jump out to anybody and holler."

At 93, Mason knows Oriental about as well as anyone could.

"I still got a map that Oriental's not even on," he says.

In 1907, Mason saw Oriental for the first time. At just 5 years old, he came from a tiny town across the Neuse to sell watermelons at the annual July Fourth party. In the early 1900s, he'll tell you, Oriental was bustling. His hometown had only a single country store. The trade, people and wares of Oriental enticed him. He kept visiting until he moved there, 12 years later.

In 1932, Mason built his home, which is still the only stone house in Oriental. Oftentimes, Louis B.



Sailing on the Pamlico

Midyette, better known in Oriental history as Uncle Lou, would come sit on Mason's front porch, look out at the Neuse and tell the stories of Oriental's beginnings.

Sitting on his porch years later, Mason shares them again. In 1872, Uncle Lou lived on Roanoke Island and worked hauling salt mullet to Norfolk, Va. He had heard that New Bern had a better, more convenient market. He went to see for himself.

On the way there, a storm ran his boat aground near Smith Creek. Uncle Lou climbed a tree to get his bearings and saw a light. The light was from a house owned by a man named Chadwick, who helped Uncle Lou tie up his boat, gave him a place to sleep

Continued

and mentioned that he wanted to sell his house.

Uncle Lou went on to New Bern, where the market for salt mullet was good. Back home, he couldn't stop thinking of Smith Creek, which was close to New Bern and had a good harbor, lots of farmland and a river jumping with mullet.

Uncle Lou didn't have any money. Instead, he convinced a

nameplate from *The Oriental*, a federal transport ship that had sunk off Bodie Island during a storm in 1882.

Interestingly, Oriental means "far east." Although it's not clear if Aunt Becky liked the name for this reason, she liked it enough that she wrote it down and suggested it when the town needed a name.

In those early days, Oriental's lifeblood was the water, but it wasn't

Norfolk and Southern to replace its steamships with a railroad. People came from the nearby communities of Pamlico, Florence, Whortonsville, Adams Creek and South River to trade.

At one point, there were almost twice as many people living in Oriental as there are now. There were cotton gins, boardinghouses, an ice plant, an oyster cannery, a tile plant, a music store, a drugstore, doctors' offices,

barber shops, livery stables and millineries.

Oriental had the first electric light company in the county and the first motorized school bus in the state.

However, the Roper mill burned in 1913, the Depression hit, a series of hurricanes struck and refrigerated trucks replaced steamships and railroad cars. By the time the railroad ceased operation in the 1950s, most of the people had left.

For many years, few newcomers moved to Oriental. "In the '20s and '30s," says Mason, "all the young people left to find jobs."

"In this

county," agrees Gwaltney, "there have been no jobs and no future for the children."

Today, there are the seafood processing plants that opened in the 1950s, a few farms, some crabbers and fishermen, the Hardee's that opened up in nearby Bayboro and a Food Lion coming to the county soon.

But most jobs in Oriental stem from its newest industry: sailing.



Overlooking the Neuse

relative to move to Smith Creek with him and buy the house. Later, Uncle Lou convinced many of his friends to move there too.

By 1886, the town had grown and it needed an official name for the post office. Smithville was rejected because the state already had one. Uncle Lou's wife, called Aunt Becky, had just been to a friend's house on Roanoke Island. There she saw the

sailboats that filled the horizon. People plyed the water to catch and haul fish, ship potatoes and cabbage from Pamlico County farms, and mill and ship the area's abundant lumber. Norfolk and Southern steamships carried freight and people to and from New Bern and Norfolk.

The John L. Roper Lumber Co. was one of the biggest businesses in town. In 1907, the company persuaded

In the late 1960s, word began to spread of the quiet beauty and great sailing that Oriental offered. Slowly, sailboats began to appear, new houses and developments were constructed, and shops and stores that cater to sailors were opened.

Gwaltney's father was among the first to realize that real estate was the new opportunity in Oriental. Those who left to find work years ago began

moving back to retire. Retirees from the North and West and even a few young families come now, most drawn by the lifestyle and the water.

Today, at least seven real estate agencies lease or sell property in Oriental and surrounding subdivisions. Prices range from an old fixer-upper for \$19,000 to a choice creekside lot for \$450,000.

You might think that those who had lived in Oriental for decades would resent the influx of wealthy sailors, marinas and homes. But to Oriental, this is a chance for life. A new subdivision needs construction workers. maintenance, developers. A new marina needs a caretaker.

"I don't think anybody minds the level (of sailors) that we have now," says Margaret Madgwick, one of Oriental's three town commissioners. "It's part of the lifeblood of the town."

"Some (sailors) treat some of the local people like they're ignorant," Bolin says. "But that's not true of all sailors. Most people are really looking forward to growth because it gives their children an opportunity for work."

Not only locals get work. Many people move to Oriental to try their hand as entrepreneurs.

At the Island Waterway Treasure Co., you can rent a bicycle for the day or buy a raincoat or wind chime. "I like it here," says the owner, who has sailed the area for more than 18 years and lived and worked there for about eight. "It's a neat place to live."

Not every dream is lucrative. "It's

can take sailing lessons or a cruise. Hungry sailors have places to eat, such as the Trawl Door, winner of eight consecutive Silver Spoons and a Golden Fork.

There are two new bed-andbreakfast inns. And people tired of sailing can look in gift shops, such as The Holly and the Ivy, Croakertown or Dragonfly.

Although these kinds of develop-



Billy and Lucille Truitt at the Ol' Store

very difficult for a store to make a go of it," says Madgwick. "In the summer, they think, 'I can really do something with this,' but in January and February,

"Some made it with great success," she adds. "Some don't make it at all.'

Now businesses sell boats, supplies and sails. Shops paint and repair vessels and motors. First-timers ment are an economic lifeline to Oriental, they also add responsibilities for managing and protecting the town. Its town commissioners must prepare Oriental for the future. They don't want to lose their quiet way of life to an overflow of tourists or have the Neuse polluted.

One item on the Oriental agenda is keeping the right-of-way to the water in Continued

the hands of the public rather than private developers. Oriental is one of many coastal towns in the public trust battle.

Another issue is zoning. In Oriental, there is none.

"The town is quite divided," says Madgwick. Although some see zoning as a way to protect water and land from harmful or intense development, others see it as government telling them what they can do with their land — land they've been using for decades.

These big-city changes have always made Oriental residents wary. At first, many were opposed to paving streets and adding curbs and gutters. In the early 1900s, many thought that electricity would add costs for a service they weren't ever going to use.

Although Oriental's new residents might create the need for these changes,



often they use their life experiences to help the town. Madgwick, who lived in Australia before moving to Oriental, is working on the public trust issues as a town commissioner.

Madeline Sutter, who was a landscape architect in St. Louis, has helped raise funds for city benches as a member of a women's club — The

Ladies of the Neuse. She's also been working to implement a masterplan for planting and maintaining trees on city streets.

Bolin, who once worked for Pamlico County Keep America Beautiful, is writing a history of the town and its people.

Gwaltney wants to build a small mall for Oriental to attract businesses. He's making sure it fits with the character of a sailing town.

"The village of Oriental is going to be able to retain its culture and the way of life that was here 10 years

ago," says Gwaltney.

The culture is a relaxed one, the way of life one of community. And it's the reason people stay in Oriental.

"People might come here with pretensions because they haven't shaken them out yet," says Madeline. "Then someone says, 'C'mon, who are you kidding?" 0

The Legend of Teach's Oak

More than one famous sailor has cruised the creeks of Oriental. Edward Teach, known as the fierce and frightening pirate Blackbeard, is said to have hidden around Smith and Greens creeks.

Blackbeard was rumored to be hideously ugly, wearing his beard in braids that looked like writhing snakes. From Teach's Cove, at the intersection of the two creeks. Blackbeard would hide behind a huge oak and watch for potential targets sailing down the Neuse.

According to legend, Blackbeard left a captured princess near Oriental and buried the booty from her ship under the oak, never to return. Blackbeard was beheaded in 1718, and Teach's Oak fell during a storm in 1958. To date, no one has found the treasure.

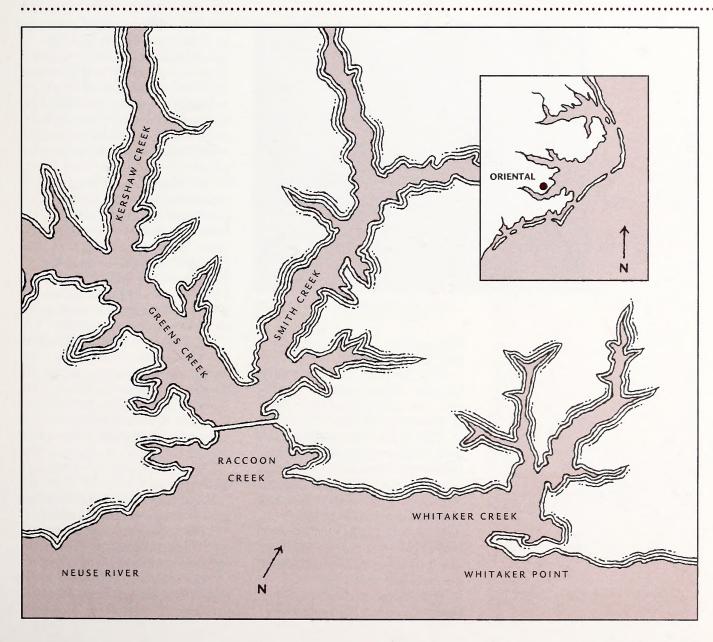
Festive Oriental

Oriental boasts more than its share of festivals:

- · On New Year's Eve, children and adults join in under the giant Chinese Dragon as it travels through Oriental's streets.
- Celebrate the Fourth of July with the Oriental Sailing Social and Croaker Festival.

Celebrating that most vocal of fish, the festival packs the town for food, games and a parade.

- · On the second Saturday in December, join Oriental shop owners for The Spirit of Christmas. The main street is lined with luminarias, and shop doors are opened to share food and drink with patrons.
- There are also races and regattas: The Neuse Sailing Association Clinic is in mid-April; Watercolor Week, in late June; the Annual Oriental Rotary Tarpon Tournament, July 28 through 30; and The Oriental Cup, in mid-September.

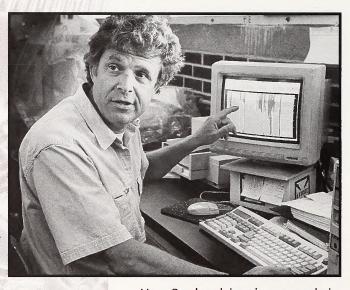


High-Tech Tools

By Kathy Hart

Sea Grant researchers Hans Paerl and James Pinckney are doctors of sorts.

Their patient is an ailing coastal ecosytem with a litany of symptoms — algal blooms, fish kills and oxygen depletion. The diagnosis is simple and obvious, even to the untrained eye. It's eutrophication — too many nutrients —



Hans Paerl explains pigment analysis.

spurring massive algal blooms that harm waters where they multiply.

To determine a treatment, Paerl and Pinckney are using tools that range from microscopes to computers, from hydrocorrals to satellites.

During recent decades, our state's rivers, estuaries and ocean have been inundated with nutrients. Nitrogen and phosphorus pour from waste treatment plants and industries; drain from farmlands, forests and city streets; trickle through groundwater from hog lots and poultry houses; and rain from clouds seeded by factory, agricultural and fossil fuel emissions.

This deluge of nutrients into ecosystems already rich in their own

natural supply causes eutrophication, which is responsible for a variety of ills now plaguing salt marshes, brackish coastal rivers and nearshore waters.

Large doses of nitrogen can spur planktonic algal species into rapid growth patterns called blooms. Some species are advantageous, offering a ready supply of meals for creatures higher up the food chain. Other algae aren't so desirable.

Surface blooms of blue-green algae, for instance, are inedible for some marine animals because they release toxins and are too big for tiny zooplankton to eat. A bloom can also alter light penetration to the bottom and rob the water of oxygen when it dies. As a result, desirable species of plants, fish and shellfish are often driven away or killed.

Dinoflagellates, a form of algae, can be toxic to fish and shellfish or contaminate them with toxins that make them undesirable meals for others, including humans. The red tide dinoflagellate, *Gymnodinium breve*, blew ashore from the Gulf Stream in 1987, contaminating shellfish and causing minor respiratory problems for beachcombers and fishermen.

As increasing amounts of nutrients flow into coastal ecosystems, the incidence of nuisance algal and dinoflagellate blooms has increased. Scientists such as Paerl and Pinckney know there is a relationship between marine algal species and nutrients, but they are not sure of the specifics.

What forms of nitrogen cause the species to grow?

How fast do nuisance algal species grow in nutrient-rich coastal waters?

Which combination of conditions, natural and man-made, spur nuisance algae and dinoflagellates to bloom?

Can scientists predict when massive algal or dinoflagellate blooms are likely to occur?

Track River's Health

These questions have scientists looking to the latest technology for answers.

Paerl, Pinckney and a host of graduate students are "fingerprinting" different species of algae. Using sophisticated diagnostic equipment and the latest in computer technology, the team is deciphering pigment "signatures" for a host of marine algae, including harmful dinoflagellates and blue-green algae.

Just as people have distinctive fingerprints, each algal group has distinctive photopigments.

Pigments are like antennae, Paerl says. They collect light energy and transfer it to chlorophyll for growth in a process called photosynthesis. But because there is so much competition among marine algae for the light available in water, each species harvests light from different regions of the spectrum and develops distinctive photopigments to compete and coexist with other species.

Using an array of methods and equipment — high performance liquid chromatography, spectrophotometry and computer graphing tools — Paerl and Pinckney can identify algal groups according to their characteristic pigment signatures. Ultimately, it comes down to a computer-generated pigment analysis marked by multicolored vertical lines. Each line corresponds to different photopigments, which indicate the abundance of major algal groups.

After a few comparisons to their "library" of pigment fingerprints, Paerl and Pinckney can determine exactly which algal groups are present in a water sample and how abundant they are — all in a matter of hours. Before development of this technology, this analysis would have taken weeks in the lab and hours of tedious, demanding work at the microscope.

This technology may also soon enable scientists to analyze coastal waters for the presence and abundance of suspended algae, called phytoplankton, from imagery collected by aircraft or satellites. The researchers are supplying photopigment data to scientists developing the technology needed to make such analysis feasible and practical.



Paerl and James Pinckney take water samples with a graduate student at the hydrocorrals.

Paerl says aerial sensory information, called remote sensing, may allow scientists to predict algal blooms, specifically blue-green algae and dinoflagellates, before they occur. And scientists may be able to track the responses of the phytoplankton communities to the slug of nutrients that drains from watersheds into adjacent waters after heavy rainfalls.

In another laboratory advancement, Paerl and Pinckney are inoculating phytoplankton photopigments with radioactive carbon 14. The rate at which the carbon 14 is used for photopigment synthesis indicates how

Continued

A Summit for Nutrient Information

In August, the North Carolina Nutrient Summit will review nutrient enrichment from past to present to future. The summit, sponsored in part by N.C. Sea Grant, N.C. Coastal Federation and N.C. Department of Environment, Health and Natural Resources, will cover sources, impacts, trends, alternative

approaches, management strategies and the future. Speakers include James Pinckney of the Institute of Marine Sciences in Morehead City, JoAnn Burkholder from the botany department of N.C. State University and Bob Lucas, chair

Commission.

The summit will be held Aug. 15 and 16 at the Jane S. McKimmon Center at N.C. State University in Raleigh. There will be a \$20 registration fee before Aug. 5 and a \$25 fee afterward. Fee includes coffee breaks and a luncheon.

of the N.C. Marine Fisheries

For more information, contact the N.C. Coastal Federation at 1-800/232-6210 or N.C. Sea Grant at 919/515-2454.

fast the algae are growing, Paerl says.

Before this technique was developed, scientists could determine how fast an entire community of phytoplankton was growing. But now Paerl and Pinckney can simultaneously assess growth rates for a variety of species present in a single sample.

Although it might seem that most of the Sea Grant researchers' work is in the laboratory, that's not the case. These high-tech lab procedures are allowing the scientists to test a host of hypotheses in the field.

In ponds behind the Institute of Marine Sciences, Paerl and Pinckney



A form of blue-green algae

have set up two rows of circular, translucent fiberglass tanks called hydrocorrals that are 1 meter in diameter. The hydrocorrals are filled with water from nearby Bogue Sound.

The two use the hydrocorrals to test how phytoplankton react to various doses of nitrogen. In one set of corrals, the scientists are testing algal growth rates in response to a single large dose of nitrogen. This simulates what happens after a heavy rainfall when large amounts of nitrogen are discharged from municipalities, farms and forests into coastal watersheds.

Actual rainfall, collected by the researchers, is also added to the corrals.

Rainfall contains nitrogen from fossil fuel and factory emissions to the atmosphere as well as the ammonia given off from animal lots. But the nitrogen composition of rainfall is different from the nitrogen that washes from fields and forests. Paerl speculates that algal species may react differently to the various chemical derivatives of nitrogen and that atmospheric sources of nitrogen may play a greater role in coastal eutrophication than scientists first believed.

By regularly analyzing samples taken from the hydrocorrals, Paerl and Pinckney can use the techniques described earlier to assess which algal groups and species respond to different types of nitrogen, how fast each grows and which species dominate.

In another set of corrals, the scientists administer regular doses of nitrogen to simulate the more constant discharge of nutrients into the water. This treatment mimics waste treatment outfalls, industrial effluents and groundwater outflows.

In addition to the hydrocorral experiments, Paerl and Pinckney also collect and analyze field samples from the Neuse River, Bogue Sound and a nearshore sampling station. Using information gathered from these sites, they test hypotheses, compare species composition and nutrient levels at different locations, and examine changes in water quality. In essence, they are measuring the pulse of the coastal ecosystem.

After Paerl and Pinckney enthusiastically explain the high-tech lab work, the hydrocorrals and sampling procedures, the scientists grow somber. They begin to explain why separating photopigments from algal species has meaning for North Carolinians.

They want people to see the bigger picture.

They want everyone to understand that unseen nutrients washing off upstream lands are having profound effects downstream in our coastal waters. The sources of these nutrients — suburban yards, farm fields, hog lots and chicken houses, industry, sewage treatment plants and fossil fuel emissions — are all part of a thriving economy and the industrialized, build-bigger, grow-larger society we live in.

And if the flow of nutrients to coastal water seems heavy now, it may soon be gushing as North Carolina's Coastal Plain continues on its course of population growth, development and industrialization.

Although many people welcome economic development in eastern North Carolina, they must also realize its cost, Paerl says.

"We're simply making our estuaries and nearshore waters too productive," he says. "And much of what they're producing is undesirable. If you compared it to agriculture, it's like growing weeds instead of soybeans or corn."

Already, the Neuse River has been designated one of the nation's 20 most threatened rivers by a national environmental group, American Rivers. For more than a decade, the Chowan River has experienced recurring blooms of blue-green algae.

Because our estuaries "have exceeded their tolerance threshold," Paerl predicts:

- Fisherman may soon be catching catfish instead of flounder because of changes in the food web and reduced oxygen.
- Scientists will see increasing blooms of toxic dinoflagellates, bluegreen algae and other nuisance algae that may reduce the production of fish and shellfish and decrease tourism at waterfront resorts and recreational areas.
- Fish kills will become more prevalent as massive dying blooms of phytoplankton rob coastal waters of oxygen needed to sustain fish and shellfish.

And the problem isn't just North Carolina's to tackle. In coastal waters in other parts of the world, the nutrient load is greater and the problems more serious. In the Baltic, North and Mediterranean seas and Sea of Japan, Paerl says scientists are seeing open ocean blooms of algae and dinoflagellates.

In fact, Paerl believes that coastal eutrophication may be the repository for some of the missing carbon dioxide that has atmospheric and global-change scientists mystified worldwide.

It seems the Earth's carbon dioxide checking account doesn't balance. The amount of carbon dioxide in the atmosphere doesn't match what is used by terrestrial plants. There's some missing.

Since phytoplankton "breathe" carbon dioxide like land plants, Paerl speculates that increased algal production worldwide has created a growing coastal "sink" for carbon dioxide, one of the greenhouse gases. As the algae die, they fall to the bottom, creating carbon depositories in coastal sediments.

These sinks may help in negating the greenhouse effect, Paerl says, but the cost of increased algal production is too high and the effects of carbon storage in coastal sediments is unknown.

So what are the solutions?

The flow of nutrients to coastal waters must be reduced, and everyone from the Durham homeowner to the Sampson County hog farmer to the Raleigh legislator needs to think how that flow can be slowed. It may require tougher water quality standards; controlled releases of nutrients during less bloom-prone times of year; more and improved holding ponds for animal lots; more prudent applications of fertilizer on farm fields, back yards and golf courses; and cleaner fuel sources for cars.

The list is endless, but the message is clear, according to Paerl and Pinckney. If we don't stem the tide of nutrients, the quality of coastal waters will continue to degrade, and red tides and algal blooms will become as much a part of the coastal landscape as sea oats and salt marsh grasses.

Glossary of Terms

- algae small, floating, nonwoody plants that inhabit fresh and salt water.
- algal bloom rapid algal growth that usually results in a discoloration of the water.
- chlorophyll the photosynthetic pigment responsible for converting light energy to chemical energy used for plant growth.
- dinoflagellate a microscopic algae that is commonly found in coastal waters.
- eutrophication the excessive addition of nutrients that spurs accelerated algal growth, creating more plant biomass than the ecosystem is capable of using.
- nitrogen a biologically important nutrient essential to plant growth, which exists in solid, gaseous and liquid states. Nitrogen supply regulates plant growth in North Carolina's estuarine waters.
- phosphorus a mineral nutrient also required for growth, which exists mainly as phosphate, a dissolved solid.
- photosynthesis the conversion of light energy to chemical energy. Plants use water, carbon dioxide and sunlight to manufacture sugars that are used for growth.
- phytoplankton microscopic, photosynthetic plants that are suspended in the water column.
- plankton organisms, both plants and animals, that are suspended in the water column and transported by tides and currents.
- pigments large, colored molecules that capture light energy and make it available for photosynthesis.

Saltwater Fishing

By Rachel Wharton Illustrations by Anne Marshall Runyon

Recreational fishing in North Carolina is a diverse sport. For many, it's an obsession. For others, it's a new venture — a beginner throwing a line off a pier happy to catch anything. And for some, it's dinner.

But whether novices or competitors, the anglers who come to North Carolina waters every year grow in number by leaps and bounds. In 1993, the N.C. Division of Marine Fisheries reported that nearly 1.3 million recreational fishermen visited the state. The following is a list of what they're likely to see on the end of a hook in North Carolina estuaries and coastal waters.

These fish can be divided into three groups based on how close to the shore they are found. The first group is usually caught inshore in the sounds. Or they can be found in the surf or around piers.

Inshore fish are often small. They are called panfish because the whole fish can be fried right in the pan. These fish are often caught by anglers in small boats or from the shore. Easily hooked with simple tackle, they can be lured with bloodworms or cut bait such as small pieces of shrimp or crab.

The mackerels inhabit nearshore coastal waters. They can be trolled for or caught with hooks and lines from boats offshore. Mackerel are often caught from the end of piers, about 100 feet from shore.

The third group, which live offshore, are often called "blue-water fish" because they live in pelagic, or

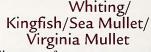
open sea, waters. These fish are usually caught from charter boats searching for marlin or other big game fish. As boating and fishing technology improve, many private boats can be found fishing these waters. Because marlin are usually released and not eaten, the catch of a yellowfin tuna, dolphin or wahoo is a welcome dinner possibility.

fish," says Sea Grant Marine Advisory Service agent Jim Bahen. In the past, North Carolina farmers who had already harvested their crops would bring their families to the coast to catch and salt or freeze enough spot for the winter.

As the third largest recreational catch in North Carolina, spot are usually fished with a hook

and line from small boats in the estuaries. Surf or pier fishermen may also hook a spot for dinner.

The fish are best eaten soon after they are caught.



Size: live up to four years; grow to 15 1/2 inches long, with the largest weighing 3 pounds

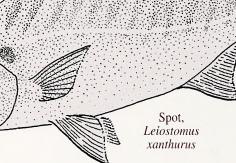
Season: found in North Carolina yearround, most abundant in the fall and north of Cape Hatteras

*Citation Size: 1 1/2 pounds

Whiting, sometimes called Virginia mullet or sea mullet, are striking fish with black-tipped fins, a chin barbel, dark blue bars and a long spine on the first dorsal fin.

Although in North Carolina the official name of whiting or Virginia mullet is northern kingfish, they are rarely called this. Local fishermen, restaurants and recipes most often call them whiting, perhaps for their delicious white, lean meat.

In the 1970s, these fish were plentiful, and anglers fishing on piers or in the surf took them home by the buckets. Although populations have decreased today, these panfish are still caught in large numbers.



INSHORE

Spot

Size: generally caught under 10 inches long

Season: found in summer and fall in North Carolina, move offshore to the continental shelf edge from Cape Hatteras to Florida in winter

*Citation Size: 1 pound

Spot, well-known members of the drum family, are bluish-gray with bronze backs, silvery bellies and diagonal orange-brown bars. Spot are named for the black spot located behind their gills.

Although spots are small, their quantities are large. "Spot have fed more hungry stomachs than any other

Atlantic Croaker

Size: seldom weigh more than 2 pounds

Season: caught in large numbers from March through October; arrive in estuaries in March and April and move offshore in early fall to waters 60 to 300 feet deep

*Citation Size: 3 pounds

Croaker are named for their vocalics: Muscular action on the air bladder creates a croaking noise. Croaker are abundant in Pamlico Sound, and on July Fourth the town of Oriental honors the fish with a celebration — The Croaker Festival.

Like spot, croaker are easily caught by baiting a hook with shrimp and casting a line in the sound or from a pier.

The croaker has three to five pairs of tiny chin barbels that

help the fish feel around the bottom for food. Croakers have a silvery, pinkish-bronze tint and small brown spots that form wavy lines from top to belly. During spawning season, croaker will turn bronze or yellow.

Red Drum

Size: are long-lived, 20 to 30 years; weigh up to 80 pounds Season: found in North Carolina year-round, usually caught in spring and fall

*Citation Size: 45 pounds

The red drum is North Carolina's state fish. Also known as a spottail bass or redfish, this drum's intrigue increased as recipes for blackened redfish became popular.

Fishermen come from around the world to fish for red drum in North Carolina waters. They often "sightfish" from small boats, moving through shallow sounds until they see a school under the water. The International Game Fish Association World Record was set near Avon

with the catch of a red drum more than 92 pounds.

However, red drum no longer make the landings list as a top recreational catch because 80 percent are released. Bag limits restrict the catch to five red drum per day per person.

Red drum are silvery gray with a coppery cast and have one or more black spots near the tail. Red drum are an excellent food fish. Smaller fish, called puppy drum, are considered the best eating. But bigger fish have traditionally been used in stews on the Outer

Banks. Spotted Sea Trout,

> Spotted Sea Trout/ Speckled Trout

Cynoscion nebulosus

Size: weigh up to 10 pounds; average fish caught is 1 to 5 pounds and 8 to 22 inches long

Season: found in North Carolina yearround; mainly fished from October to January

*Citation Size: 4 pounds

When the weather is chilly, serious recreational fishermen look for the spotted sea trout.

Usually called speckled trout in North Carolina, this fish is highly sought as a game fish. When other fish have migrated to warmer waters, hard-core anglers will be searching for the speckled trout's hiding spots in the sound.

Baked, broiled or fried, the speckled trout is considered good eating all along the Carolina coast. It is fast becoming the fish of choice in many tournaments and contests. According to the Division of Marine Fisheries, the number of pounds of

speckled trout caught recreationally in 1994 was 654,661 — almost double the catch of 1993.

The speckled trout has a long, skinny body and two upper canine teeth. Its back is dark silvery gray with a bluish tint. You can distinguish it from other sea trout by the round black spots on the upper

Summer Flounder

Size: reach lengths of 36 inches; range from 1 pound to 15 pounds Season: caught in North Carolina in the surf or from

> small boats during spring, summer and fall; move offshore to waters 120 to 300 feet deep in

colder weather

*Citation Size: 5 pounds

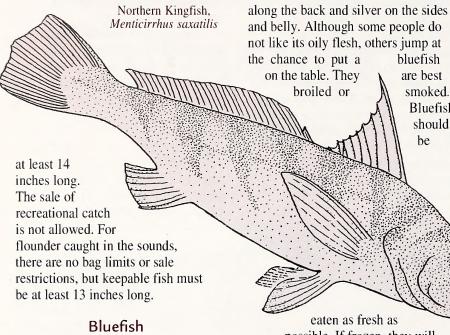
Even the most landlocked of North Carolinians could probably identify the flounder. The flounder's mild, white, flaky flesh is wellknown baked, broiled, stuffed and fried. As a member of the lefteye flounder family, the summer flounder has a broad, thin body that is easy to recognize. It's distinguished by its eyes — both are on the left side of the head. You can tell the summer flounder apart from other flounder by the three dark brown oscillated spots near its tail.

To catch food, the brown, gray or olive-colored flounder will cover itself with sand and wait for smaller fish or shellfish to come too close.

Flounder can be caught with cut bait or minnows from the surf, piers or small anchored boats. Some fishermen prefer to drift in boats using small, live fish, such as mullet or menhaden, as bait.

Bag limits for flounder caught in ocean waters are eight fish per person per day, and the fish must be

Continued



Size: measure up to 36 inches; weigh as much as 19 pounds Season: migrate north in spring and south in fall; some found in North Carolina year-round

*Citation Size: 17 pounds

Bluefish are voracious predators. When in a feeding frenzy, bluefish will form schools that bite, snap and crunch anything in their path. Fishermen standing in the surf have had bluefish chomp holes in their waders. Bluefish typically school by size. Smaller bluefish are called "chopper blues." Large bluefish are "big blues."

Bluefish are caught in sounds, from piers or in the surf. Fishermen often look for flocks of terns that hover overhead while the bluefish tear schools of small fish to shreds.

Some fishermen consider bluefish a nuisance species that they catch in pursuit of bigger fish. However, many anglers love to hook the carnivorous bluefish, which puts up a terrific fight. Although researchers are unsure of the condition of bluefish populations, state bag limits restrict the catch to 10 fish per day.

Sometimes called a snapper or a blue, bluefish are greenish-blue

eaten as fresh as possible. If frozen, they will last only a few weeks because their oily flesh becomes rancid.

broiled or

NEARSHORE

King Mackerel

Size: grow up to 5 1/2 feet and can weigh as much as 100 pounds Season: migrate south in fall and north in spring.

*Citation Size: 30 pounds, also given for a fish 50 inches or longer released alive

If size denotes royalty, then the king mackerel was aptly named. The king is the largest mackerel in the Atlantic. The species gets its scientific name, Scomberomorus caballa, from the Spanish word cavalla, for horse.

This important game fish is caught in large numbers all along the Carolina coast. Serious pier fishermen target the king mackerel as do many tournaments. Boat fishermen troll for schools of king mackerel with brightly colored lures or live bait.

King mackerel, like bluefish, can also be located by cueing on seabirds; terns wait overhead as schools of mackerel feed on smaller fish.

Spanish Mackerel

Size: weigh as much as 8 or 9 pounds; reach 3 feet in length Season: fast-moving schools migrate south in colder months and north in warmer ones; usually arrive in North

Carolina in April

bluefish

are best

smoked. Bluefish

should

be

*Citation Size: 6 pounds

Spanish mackerel, sometimes called a Spaniard, is much smaller and has spots rather than the stripes of its relative the king mackerel.

Considered large at 8 pounds, Spanish mackerel is one of the best mackerels for the table.

> They are beautifully colored, with olive and yellow oval spots, green backs and silver bellies.

Like king mackerel, Spanish mackerel have a minimum length requirement. A Spanish mackerel must be at least 12 inches long to be a legal catch, and a king mackerel must be at least 20 inches long.

However, a young king mackerel looks like an adult Spanish mackerel. The way to tell the difference is by the lateral line, a line that runs the length of the fish from behind the gills to the base of the tail. The king mackerel's lateral line

dips sharply.

OFFSHORE

Dolphin/Mahi-Mahi

Size: grow up to 6 feet long; weigh as much as 50 pounds Season: found year-round near

floating weeds in or near the Gulf Stream off the North Carolina coast *Citation Size: 35 pounds

The brightly colored dolphin is highly regarded as a food fish. Its delicate white flesh is usually found in gourmet recipes under its Hawaiian name, mahi-mahi. By either name, the dolphin is one of the top offshore game fish in North Carolina.

Dolphin can usually be found near floating sargassum or other weeds, which provide them with food and a hiding place. Dolphin hunt in packs, and if you can lure just one, the entire school will most likely follow.

Dolphins have bright turquoise, yellow, blue and green patterns that fade to yellow or silver almost immediately upon death. Adult males are shaped like battering rams, with flat, blunt faces and high foreheads.

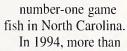
wahoo appear to "light up" when they get excited, glowing beneath their steely-blue exterior. Sometimes called tiger fish, the wahoo is often mounted to display its blackish-blue bars that resemble a tiger's stripes.

Yellowfin Tuna

Size: short-lived; have explosive rates of growth; can measure up to 6 feet long and weigh as much as 300 pounds **Season:** found in deeper waters year-round

*Citation Size: 70 pounds

As its popularity and populations have grown, the yellowfin tuna has become the



3 million pounds were caught recreationally.

Like the king mackerel, the yellowfin tuna is an exciting catch because it can be caught by trolling a bright lure.

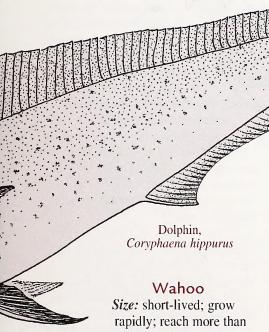
Metallic blue and torpedo-shaped, the vellowfin tuna has a vellow belly and fins. It is the most brilliantly colored of the tuna. Sometimes called a longfin, you can tell it from other tuna by its elongated anal and dorsal fins.

Several of these fish have federal and state minimum length requirements or bag limits not listed here. For more information, call Sea Grant at 919/515-2454 and ask for "A Recreational Guide to Management of Fish in South Atlantic Waters" (Sea Grant publication number UNC-SG-89-06). The two-page chart lists biological data and state and federal regulations for popular species of marine fish found off the North Carolina coast.

THE TOP 10: 1994 Recreational Landings

The N.C. Division of Marine Fisheries estimates the yearly catch of recreational species. They gather data such as landings, effort and location. The division can use this information to make management decisions, stock assessments or rankings of recreational catch.

- 1. Yellowfin tuna 3,863,481 pounds
- Dolphin (mahi-mahi) 2,133,095 pounds
- 3. Spot 1,788,220 pounds
 - 4. King mackerel 1,028,305 pounds
 - 5. Speckled trout (spotted sea trout) — 654,661 pounds
- 6. Spanish mackerel 543,719 pounds
- 7. Bluefish 537,675 pounds
- 8. Summer flounder 438,535 pounds
- 9. Wahoo -387,028 pounds
- 10. Atlantic croaker 334,795 pounds
- * The Division of Marine Fisheries sponsors the yearly N.C. Saltwater Fishing Tournament. Citations are awarded to the anglers who catch species that exceed a set weight, known as the citation size. At the end of the year, an award is given to the angler who catches the largest of each species. For more information, contact the Division of Marine Fisheries at 1-800/682-2632.



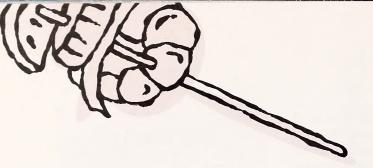
100 pounds

Season: found year-round in deeper waters

*Citation Size: 40 pounds

Anglers like wahoo because they put up a good fight when hooked. After many blistering runs and serious battles, Bahen calls this fish a "souped-up king mackerel."

A member of the mackerel family, wahoo have long, slender bodies. Like other large pelagics,



By Kathy Hart

If it's summer, it must be time to grill out. Grilling is as much a part of long, hot days as watermelon, vineripened tomatoes, picnics and weeks at the beach.

And when it comes to placing food over fire, there's nothing better than seafood, says Joyce Taylor, Sea Grant's seafood education agent.

"It's the only way I know to make the best food better," Taylor says.

Grilling is quick and easy, and it prevents heat buildup in the kitchen from hot ovens and stovetops. And anyone can master the skills of grilling. After all, searing food over an open fire is the genesis of all cooking.

Two basic concepts are key to outdoor grilling. The fire, whether gasgenerated, charcoal or wood, shouldn't be too hot (no flames required), and the grill shouldn't be too close to the fire. Either can result in a charred — read burned — exterior of the food being grilled. And who wants to waste a delicious, and often expensive, mahi-mahi fillet or tuna steak by overcooking?

For grilling

can become inedible and dangerous to eat.

like

other

meats.

It's best to buy seafood on the day you plan to grill it and store it in the coldest part of your refrigerator until it's ready for the coals.

Taylor says any species of fish or shellfish can be cooked on the grill if you make allowances for the fat content. Lean fish need to be basted frequently to keep them moist. Fatty fish usually do not require basting.

Fish in any market form — whole, pan-dressed, steaks or fillets — may be cooked over the coals. Shellfish, depending on the recipe, may be grilled in the shell or shucked.

Fish are fragile and should be

Great Grills

grease it

bring home the freshest seafood at the grocery store or fish market. On hot summer days, remember to come directly home after purchasing seafood. Ask your grocer to pack your seafood with other cold items or bring a cooler filled with ice to transport your dinner catch.

The heat buildup in your car can hasten spoilage of seafood. If left too long in a backseat or trunk, seafood,

handled as little as possible before and during cooking. The grill needs to be oiled to prevent the fish's delicate skin from sticking. Or use a long-handled, hinged grilling basket for cooking. Be

sure to too. The basket makes it easier to turn the fish and helps ratain its change

helps retain its shape.
For shellfish, such as
shrimp or scallops, the
basket prevents your
precious catch from falling
through the grill slates.

Using skewers to make kabobs is another option for outdoor grilling. Since kabobs often mix seafood and vegetables, they offer an easy way to cook an entire meal in minutes. Add a fruit salad, rice and a cool refreshment, and there's no better summer eating.

When grilling, be careful not to overcook seafood. Fish should always be moist and tender, never dry and chewy. Cook fish only until it flakes easily when tested lightly with a fork. Generally, fish require about 10 minutes of cooking per inch of thickness, but Taylor suggests you start checking for doneness in about half that time. Depending on the hotness of the coals, cooking rates can vary outdoors.

One word of caution. When your seafood is done, place it on a clean plate, Taylor says. Don't put it on the plate used to carry the raw fish to the grill. You could contaminate your dinner with bacteria in the raw juices. This rule holds true for any meat product.

seafood, start with only the freshest fish and shellfish available. No amount

of grilling or basting is going to make a spoiled fish taste better, Taylor says.

Use your nose and ask questions about catch dates to ensure that you



Below are some of Taylor's favorite recipes for grilling seafood. All have been tested and evaluated by Carteret County nutrition leaders. On a scale of 1 to 5, each received a rating of 4.5 or higher. For other options, Taylor says any recipe that specifies baking or broiling can be adapted for grilling if it doesn't call for a sauce that will burn.

Get out the grill, heat up the coals and grill a fish for dinner tonight.

Grilled Salmon with Fennel

- 4 salmon steaks, 6 ounces each, small bones removed
- 2 tablespoons finely chopped fresh parsley
- 1/2 cup finely chopped green onions, including tops
- 1 teaspoon dried fennel seeds, ground
- freshly ground black pepper
- 1/4 cup vegetable oil
- 3 tablespoons fresh lime juice

Combine parsley, onions, fennel, pepper, oil and lime juice in shallow dish. Reserve 1/4 of the marinade for basting. Place steaks in remaining marinade for 30 minutes in the refrigerator, turning once. Place in greased, hinged wire basket and cook about 4 inches over moderately hot coals until done on one side, about 6 to 8 minutes. Turn and cook on other side 6 to 8 minutes longer, or until fish flakes easily with a fork. Baste occasionally with reserved marinade while grilling. Serves 4.

• 6 catfish fillets

- 1/4 cup vegetable oil
- 1/2 teaspoon freshly ground white pepper
- 1/2 teaspoon garlic salt

Brush fillets with oil. Sprinkle one side with pepper and garlic salt. Place in well-oiled, hinged wire basket. Place about 4 inches over moderately hot coals, and grill about 5 minutes. Turn and grill on other side about 4 to 5 minutes, or until fish flakes easily when tested with a fork. Serves 6.

Marinated Charcoal-Grilled Shrimp

• 1 1/2 pounds medium or large shrimp, peeled, with tails left on

- 2 tablespoons fresh lime juice
- 3/4 teaspoon freshly ground black pepper
- 1/2 teaspoon salt
- 1/8 teaspoon dill weed
- 1/4 teaspoon sugar
- 1/2 teaspoon ground cumin
- 1/2 teaspoon basil
- 1 1/2 teaspoons pressed garlic
- 2 teaspoons finely chopped onion tops
- 1 tablespoon vegetable oil

In wide, shallow dish combine lime juice, pepper, salt, dill, sugar, cumin, basil, garlic, onion and oil. Mix thoroughly. Lay shrimp flat in mixture and marinate in

refrigerator for 20 to 30 minutes, turning once. Remove shrimp from marinade and thread on skewers or place in hinged wire basket. Cook about 4 inches over moderately hot coals about 6 to 7 minutes on each side. Serves 6 to 8.

Grilled Herbed Sea Bass

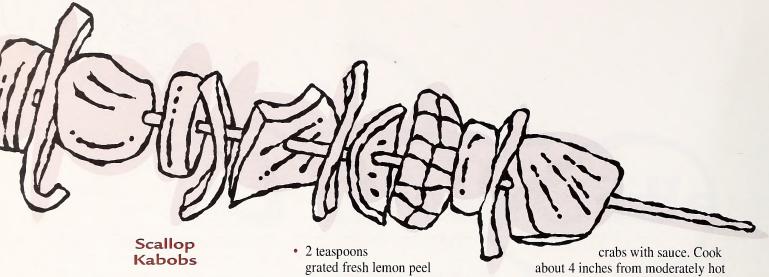
- 8 sea bass fillets
- salt to taste
- freshly ground black pepper
- olive oil
- 1 tablespoon finely chopped fresh basil
- 1 tablespoon finely chopped fresh thyme
- 6 tablespoons finely chopped fresh parsley
- 1 cup coarse dry bread crumbs

Sprinkle fillets with salt and pepper; brush with oil. Press a coating of herbs and then bread crumbs firmly into the flesh on both sides. Carefully transfer the fish to an oiled, hinged wire basket. Grill over hot coals for 8 to 10 minutes, until the crumbs are a crusty brown on one side. Turn carefully and cook on other

Continued

side. Serves 8.

COASTWATCH 19



- 1 pound scallops
- 1 can (13 1/2 ounces) pineapple chunks, drained
- 1/2 pound button mushrooms
- 1 green pepper, cut into 1/2-inch squares
- 1/4 cup vegetable oil
- 1/4 cup fresh lemon juice
- 1/4 cup chopped fresh parsley
- 1/4 cup light soy sauce
- 1/4 teaspoon salt
- · dash freshly ground black pepper

Place pineapple, mushrooms, green pepper and scallops in a bowl. In a separate bowl, combine oil, lemon juice, parsley, soy sauce, salt and pepper. Reserve 1/4 of the marinade for basting. Pour remaining marinade over scallop mixture and place in refrigerator for 30 minutes, stirring occasionally. Using long skewers, alternate scallops, pineapple, mushrooms and green pepper until skewers are filled. Cook about 4 inches from moderately hot coals for 5 minutes. Baste with reserved marinade. Turn and cook for 5 to 7 minutes longer or until scallops are tender. Serves 6.

> Indonesian Grilled Shrimp

- 2 pounds shrimp, peeled
- 2 tablespoons fresh lemon juice
- 1/4 teaspoon fresh lime juice
- 1/4 teaspoon cayenne pepper
- 1/2 teaspoon ground coriander
- 3 tablespoons molasses
- 1 large clove garlic, pressed

• 2 tablespoons vegetable oil

Stir together all ingredients except shrimp. Reserve 1/4 of the marinade for basting. Place shrimp in marinade 30 minutes in the refrigerator.

Remove shrimp. Thread on metal or wood skewers. (If using wooden skewers, soak them in cold water for 1 hour before grilling.) Grill about 4 inches over hot coals until lightly browned, about 4 minutes on each side, brushing with reserved marinade. Serves 8.

Grilled Soft-Shell Crabs

- 12 soft-shell crabs, cleaned
- 3/4 cup chopped fresh parsley
- 1/2 cup vegetable oil
- 1 teaspoon fresh lemon juice
- 1/4 teaspoon nutmeg
- 1/4 teaspoon light soy sauce
- 1/4 teaspoon Tabasco sauce

Place crabs in well-oiled, hinged wire basket. Combine remaining ingredients. Baste

about 4 inches from moderately hot coals for 6 to 8 minutes, until lightly browned. Turn and cook 6 to 8 minutes longer, until other side is browned. Serves 6.

Grilled Fish with Wine Sauce

- 2 pounds firm fillets
- 1 cup dry vermouth
- 3/4 cup vegetable oil
- 1/3 cup fresh lemon juice
- 2 tablespoons chopped green onions
- 1 clove garlic, pressed
- 1/4 teaspoon dried marjoram
- 1/4 teaspoon freshly ground black pepper
- 1/4 teaspoon ground thyme
- 1/8 teaspoon dried sage
- 1/8 teaspoon Tabasco sauce

Combine all ingredients except fish. Place fish in baking dish or nonaluminum pan; pour about 1 1/3 cups of marinade over fish. Reserve remaining marinade for basting. Marinate in the refrigerator for 30 minutes, turing once. Remove fish and place in well-oiled, hinged wire basket. Cook about 4 inches over hot coals, basting occasionally with reserved marinade. Turn once and cook until

fillets flake easily when tested with a fork, about 10 to 15 minutes. Serves 6.

Life at the WATERWORKS

State Museum Opens Freshwater Wetlands Exhibit

By Jeannie Faris

A freshwater wetland calls attention to itself in subtle ways.

It might be the low, bass croak of a bullfrog or the clacking calls of a cricket frog, a noise like marbles striking together.

It might be the sight of the endangered Venus's-flytrap slowly closing its needle-tipped leaves over an insect, a thatch of cattails or a redspotted newt darting over soggy plants.

These are some of the many natural signs that you're near one of North Carolina's freshwater wetlands. Certain plant and animal species are actually better indicators of a wetland than water, which isn't always a permanent feature. Some wetlands are dry for part of the year, making them trickier to identify than others that are wet yearround. Some have standing water, while others have saturated, soggy soil.

The differences among these habitats can be sweeping. But the links between freshwater wetlands and their roles in flood prevention, biodiversity and water quality are undeniable.

The N.C. State Museum of Natural Sciences has opened a new exhibit, Freshwater Wetlands: Life at the Waterworks, to reverse outdated images of wetlands as wastelands and to educate the public about their natural functions, says Barbara Beaman, assistant director of school programs at the museum and wetlands project coordinator.

Three years in the making, the exhibit was a response to public confusion over federal efforts to restrict the definition of wetlands — a definition that involves trade-offs between economic and environmental concerns. The museum staff decided that people needed a better under-

standing of what wetlands are and how they function.

"People were being faced with articles in the papers, and they were confused," Beaman says. "We thought that this would be an opportunity to provide information on why freshwater wetlands are important biologically."

From the 50 varieties of freshwater wetlands recognized in North Carolina, the museum chose six to showcase in the exhibit. "We picked wetlands that were significant in some way ... that represented the diversity of freshwater habitats in our state," Beaman says.

Their diversity also extends to the functions that wetlands perform. Most play a role in improving water quality, cleansing the water that runs over and through them. The impact reaches miles downstream, inextricably binding freshwater wetlands to their briny counterparts along the coast, where inland waters eventually drain. Wetlands actually slow moving water, trapping sediments, filtering out pollutants and then gradually releasing it into a stream, river or estuary. As a result, coastal waters are healthier homes for fish and shellfish because upstream pollutants have been removed.

The coastal shrimping industry obviously benefits. So do the migratory waterfowl that need a marshy stopover. Each wetland type — from the pocosin to the mountain bog contributes to the diversity and beauty of nature. Taken as a whole, wetlands are home to one in three of the nation's endangered plants and animals. In North Carolina, 70 percent of the plants and animals listed as rare, threatened or endangered species are linked to wetlands habitat.

Beyond these water quality and habitat functions, many wetlands also reduce flooding in rivers and

estuaries. During high water, they act as sponges, soaking up and storing the water in their soils and then releasing it slowly.

These are lessons that Beaman wants museum visitors to take home with them.

whether they're from the eastern or western corner of the state. The teaching tools include interactive displays, a dozen live exhibits, full-color video of wetland plants and animals, and recordings of their sounds. The

Continued

centerpiece is a walk-through diorama of nightfall along the Roanoke River bottomlands, complete with springtime sounds, special lighting effects and plant and animal specimens.

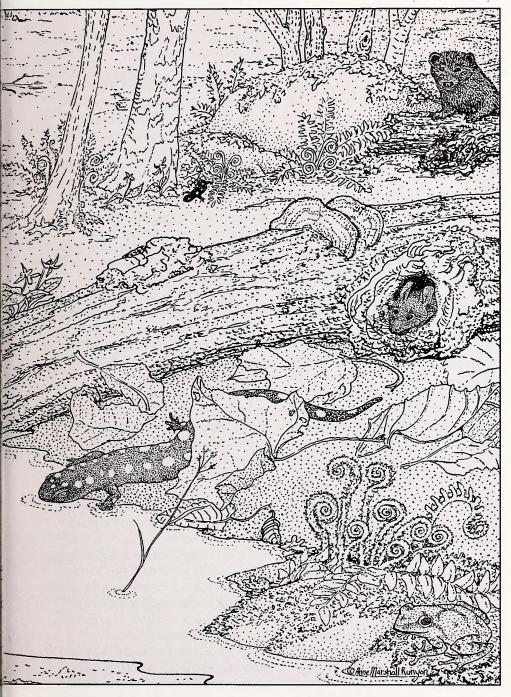
On a nearby wall, wetland scenes flash in time with the chirps, croaks and rustlings of wildlife. A greater siren buoys in an aquarium. It looks like an eel, but a closer look reveals that it's a salamander, short-legged and decorated with ruffled external gills and skin like black suede. Elsewhere, videotapes take viewers on-site with ecologists who interpret the natural history of the different freshwater wetlands. A remotecontrol microscope swings tiny pond life — paper-thin spotted flatworms, tentacled hydras, blood-sucking leeches, predatory dragonfly nymphs — onto a screen for up-close inspection. A nearby monitor explains how the diversity of wetland life includes more than can be seen with the naked eye.

Through these and other displays, museum visitors can tour six varieties of freshwater wetlands.

River wetlands are formed as rivers change course during their lifetime, leaving behind a rolling landscape of ridges and old channels that fill during floods. These rich wetland habitats support a diversity of plants and wildlife, including black bears and wood ducks that nest in old tree cavities. Unique to these areas are the ancient cypresses that have been discovered growing in the wetlands of rivers such as the Black. Bottomland hardwood forests are a common type of river wetland found in the North Carolina landscape.

Freshwater marshes are perhaps the most familiar type of freshwater wetland. They range from the simple roadside ditch with cattails to the vast edges of lakes, ponds and rivers that sprout water lilies, bulrushes, alder bushes, black willow

and blue flag iris. Beavers are wetland engineers, damming streams and flooding low-lying areas to create much of this marshy habitat. Freshwater marshes are important habitat for migratory waterfowl and other wildlife, including the greater siren and the nonvenemous northern water snake. Savannas are found in the Coastal Plain next to pocosins. They are noted in North Carolina for their unusual diversity, supporting as many as 50 plant species per square meter. Savannas are open, grassy flatlands with sparse cover of mostly longleaf pines. The area where they meet pocosins is called an ecotone, where the largest number of rare species is found,



including the protected Venus'sflytrap and the endangered roughleaf loosestrife. The federally endangered red-cockaded woodpecker also lives in savannas because it prefers their old-growth pines with softened centers for building nesting cavities.

Pocosins are found only in the southeastern United States, and

they're more plentiful in North Carolina than anywhere else. They occur on flat, elevated areas between streams in the Coastal Plain, often next to savannas. Underlain by spongy organic deposits called peat, pocosins are able to soak up and slowly release large amounts of water into nearby rivers and sounds. Dense thickets of evergreen shrubs, vines

and a pine overstory provide food and shelter for wildlife such as the black bear, deer, bobcat and the pine barrens tree frog, an endangered species.

Seasonal wetlands fill with winter rains and dry out in summer and fall. And though they may appear as ordinary as a backyard puddle, these wetlands are critical habitat for breeding amphibians. They are needed by species such as the spotted salamander to give birth and raise young away from fish that would eat their eggs and larvae. In the dry season, the salamanders live in upland areas around seasonal ponds, but they return to their birthplace year after year to breed. Because seasonal wetlands are typically smaller than 1 acre, they are not well protected by wetlands regulations.

Mountain bogs often form at the base of mountain slopes on flat land. They are fed by seeps or springs and covered with mounds of sphagnum moss, which can absorb large amounts of water and provide a base for other plants to grow. The bogs are made up of thick layers of peat and black mud, and they are nature's only habitat for the mountain sweet pitcher plant, the endangered green pitcher plant, the bog turtle and many other rare species. As many as 40 percent of the mountains' threatened and endangered species live there.

Beaman says the freshwater wetlands exhibit, opened April 29, is typical of other exhibits that will be offered once the museum moves to a larger site in 1998. A teachers' guide and video based on the exhibit will soon be available for classroom use. The N.C. State Museum of Natural Sciences can be reached by writing P.O. Box 29555, Raleigh, NC 27626-0555 or calling 919/733-7450. It is located on the plaza near the intersection of Salisbury and Jones streets in downtown Raleigh. Hours are 9 a.m. to 5 p.m. Monday through Saturday and 1 p.m. to 5 p.m. Sunday.

New Rip Currents Poster Available

Rip currents can pull even experienced swimmers away from shore. Often mistakenly called undertows, they are to blame for many beach drownings each year. N.C. Sea Grant has a new, eye-catching poster designed to instruct swimmers how to recognize and escape a rip current. Earlier versions of this popular poster have been credited for saving lives along the coast.

You can recognize a rip current — by sight or by feel — and survive if you know what to do and remain calm. Contrary to myth, they don't suck swimmers under. Rather, they are formed anywhere water rushes out to sea in a narrow path. The best response is to swim parallel to shore until you're out of the current or float until it dissipates.

The colorful, 11-by-25 1/2 inch poster depicts a swimmer in a rip current and explains with visuals and words what to do. The poster also illustrates two spots where rips are likely to form — around a break in a nearshore sandbar and where the current is diverted by a groin or jetty. The text describes what rip currents are, how to recognize them from shore and how to respond if you're swept away.

Printed on glossy paper with a protective U/V coating, the poster can be laminated for display outdoors. Single copies are available free. Write Sea Grant Publications, Box 8605, N.C. State University, Raleigh, NC 27695-8605. Ask for publication number UNC-SG-95-03. To order larger quantities, call 919/515-2454.

Erosion Assistance To Retreat in September

More than 240 erosion-threatened buildings in coastal North Carolina have been voluntarily moved or demolished using federal funds since 1988. But after Sept. 23, the burden of this cost will revert to individual property owners. In the future, assistance will be given only if the building or structure has already been damaged by a storm or flood.

Congress has repealed the legislation that provides public assistance through the National Flood Insurance Program and placed the September deadline on the filing of claims.

"Owners of oceanfront property threatened by shoreline erosion should give serious consideration to starting the claim process now if they wish to take advantage of this last chance for financial assistance," says Spencer Rogers, N.C. Sea Grant's coastal construction and erosion specialist.

"It is extremely unlikely that owners will ever again have the level of financial support for moving to safer ground or demolishing the building without restrictions," he says.

Rogers has a handout that describes who qualifies for assistance and how to file a flood insurance claim. For a copy, call Rogers at the Fort Fisher Sea Grant office, 910/458-5780. Or write to him at P.O. Box 130, Kure Beach, NC 28449.

Fast and Furious Hurricanes Remembered

Barbara, Carol, Diane and Ginger were fast, fickle and dangerous. But they weren't past loves or high school sweethearts. They were hurricanes.

In "North Carolina's Hurricane History," Jay Barnes outlines the state's repeated affairs with tropical cyclones since 1526. Barnes, the director of the N.C. Aquarium at Pine Knoll Shores, interviewed coastal residents and researchers and searched newspaper reports, letters, National Weather Service records, dusty books and documents to compile almost 500 years of Tar Heel hurricane history.

More than 50 stories are recounted of hurricanes that wreaked havoc on the barrier islands, coastal communities and landlocked Carolina cities. Told are the legends, the fears, the power of waves and winds, and the oddities.

There are the forgotten cyclones, such as The Great Storm of Aug. 18, 1750, that destroyed the Onslow County Courthouse and scattered all of the county's records and deeds.

And there are the storms that people wish they could forget. Barnes details the relentless winds and blistering surf of the 1950s that gave eastern North Carolina the nickname "Hurricane Alley." Barbara, Carol, Edna, Hazel, Connie, Diane, Ione, Helene and Donna all battered the coast during this 10-year period. In 1954, Hazel killed 19 people, injured more than 200 and caused an estimated \$136 million in property damages in North Carolina alone. Hazel is one of the worst U.S. hurricanes in 20th-century history.

Although the anecdotes and sketches of early storms are intriguing, it is the pictures Barnes compiled of later storms such as Hazel that make the book fascinating.

The book is brimming with maps, charts and diagrams that explain and illustrate where hurricanes come from, why they cause such destruction and how we monitor them. The book also includes chapters on how hurricanes affect wildlife and how to survive hurricanes and nor'easters (not hurricanes but sometimes as destructive).

The book is available from the University of North Carolina Press. It is \$16.95 in paperback and \$34.95 in hardcover. To order, call 1-800/848-6224.

Seafood Guru Cooks Up Publicity

N.C. Sea Grant has a rising media star.

Joyce Taylor, Sea Grant's seafood education agent, was spotlighted in the June issue of *Wildlife in North Carolina*.

In the article, entitled "Guru of Seafood," writer Sarah Friday Peters

introduces readers to Taylor's engaging personality and extensive knowledge of fish and shellfish.

Noting her nose for seafood and penchant for quality, Friday describes Taylor as "North Carolina's premier seafood specialist." After 20 years of extolling the virtues of the fisherman's catch and testing more recipes than would fit in a file box, it seems proper that Taylor should receive such a laudable tribute.

Big Sweep Set For September 16

Be the solution to water pollution; join the First Citizens Banks Big Sweep. Scheduled for Saturday, Sept. 16 from 9 a.m to 1 p.m., Big Sweep is the nation's largest statewide waterway litter cleanup.

Last year, more than 13,000 North Carolinians gave four hours of weekend time to become environmental stewards. In all, they sacked more than 197 tons of debris from lakes, river, streams and beaches.

Besides bagging litter, volunteers also recorded their trashy collection on data cards that were later compiled by the Center for Marine Conservation in Washington, D.C. Using the statistics, Big Sweep coordinators can better pinpoint which areas are most in need of trash pickup and education and who's leaving behind the offensive litter.

Big Sweep is concerned about litter because of its many impacts, says Judy Bolin, Big Sweep's executive director. Trash is unsightly, harmful to people, costly and deadly for wildlife.

Big Sweep has removed more than 1,203 tons of debris from waterways statewide since it began as a small beach cleanup nine years ago.

For the fifth consecutive year, First Citizens Bank is supporting the cleanup as title sponsor.

Although corporate support makes Big Sweep a financial reality, it's the grassroots volunteer work of North Carolinians that makes Big Sweep a success year after year, Hart says.

Big Sweep attracts volunteers of all ages, and it's especially popular among school classes, church groups, civic clubs, Scouts and environmental organizations.

To locate pickup sites in your area, drop by your local branch of First Citizens Bank for a brochure after Aug. 15 or call the MCI Big Sweep toll-free hotline at 1-800-27-SWEEP.



To help support the cleanup's educational efforts, buy a Big Sweep '95 T-shirt. They are available in medium, large and extra-large and cost \$12. To order, write N.C. Big Sweep, Box 908, Raleigh, NC 27602.

Sea Grant To Host National Fisheries Forum

Sea Grant is sponsoring a fisheries issues forum at the National Press Club in Washington, D.C., on Sept. 11. This national project is being coordinated by the Sea Grant communications leaders in North Carolina, Washington and Wisconsin.

The forum, "Can America Save Its Fisheries?," is designed to help the national media and policy-makers better

understand the problems and complexities inherent in managing the nation's fisheries.

Through a panel format, the forum will address three questions: Who owns the fish? Are we organized to manage? How are the changing coasts affecting fisheries? Each panel will address the three issues from a variety of perspectives, offering media the opportunity to interact with nationally known academics, resource managers, commerical fishermen, recreational anglers, environmentalists and seafood processors.

"We felt the forum offered a perfect format for Sea Grant to do what it does best — act as an information broker to the media about national fisheries issues," says Kathy Hart, Sea Grant's communications coordinator.

For more information about the forum or registration information, contact Hart at 919/515-2454.

Coastwatch and "Seas of Debris" Win Praise

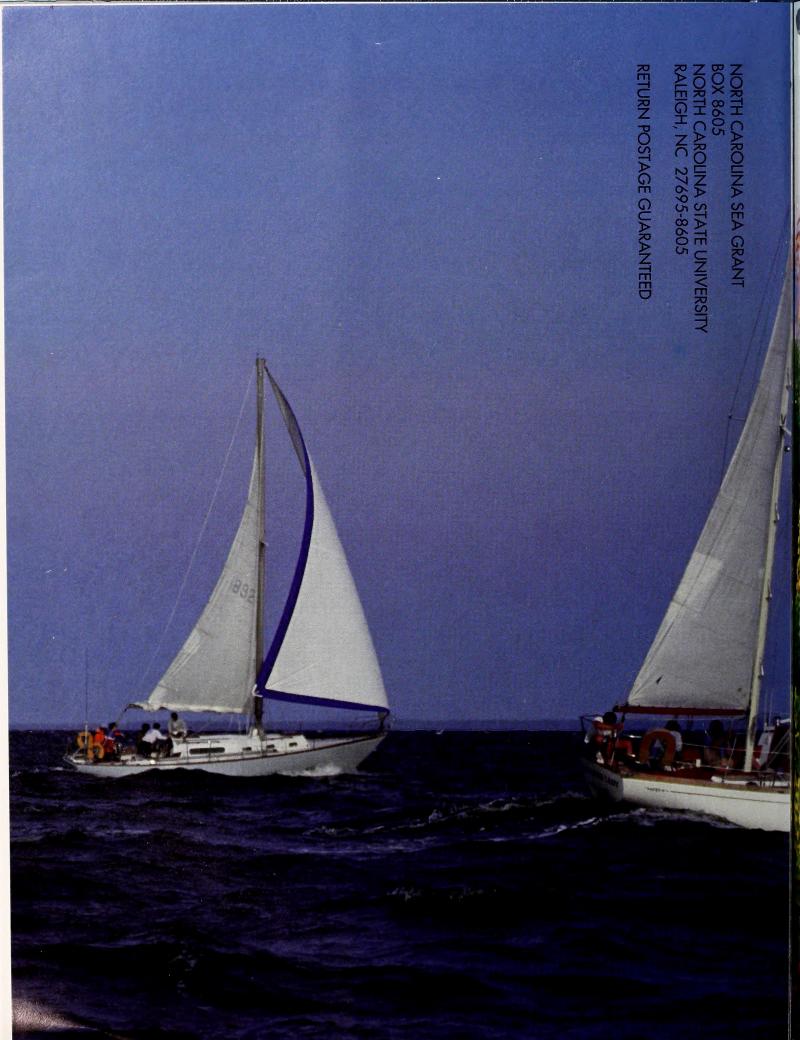
Coastwatch did it again.

For the sixth consecutive year, *Coastwatch* won an APEX '95 publication award from Communications Concepts, publishers of *Writing Concepts*.

Coastwatch was one of 15 Award of Excellence winners in the category of subscription magazines and journals. Overall, 518 publications competed in the magazine and journal competition.

The award was based on excellence in graphic design, editorial content and the success of the entry in achieving overall communications effectiveness and excellence.

"Seas of Debris: A Summary Report from the Third International Conference on Marine Debris" also won an APEX '95 Award of Excellence in the special report category. It was written by Sea Grant communicators Jeannie Faris and Kathy Hart, designed by Linda Noble and published by N.C. Sea Grant for the National Marine Fisheries Service. It competed against 220 entries.





Coastwatch Staff:

Kathy Hart, Managing Editor
Jeannie Faris and Carla Burgess,
Senior Editors
Larisa Tatge and Rachel Wharton,
Staff Writers
L. Noble, Designer
Sandra Harris, Circulation Manager

The North Carolina Sea Grant College Program is a federal/state program that promotes the wise use of our coastal and marine resources through research, extension and education. It joined the National Sea Grant College Network in 1970 as an institutional program. Six years later, it was designated a Sea Grant College. Today, N.C. Sea Grant supports several research projects, a 12-member extension program and a communications staff. B.J. Copeland is director. The program is funded by the U.S. Department of Commerce's National Oceanic and Atmospheric Administration and the state through the University of North Carolina.

Coastwatch (ISSN 1068-784X) is published bimonthly, six times a year, for \$15 by the North Carolina Sea Grant College Program, Box 8605, N.C. State University, Raleigh, NC 27695-8605. Telephone: 919/515-2454. Fax: 919/515-7095. E-mail: k_hart@ncsu.edu. Second-Class Postage paid at Raleigh, N.C.

POSTMASTER: Send address changes to *Coastwatch*, N.C. Sea Grant, Box 8605, N.C. State University, Raleigh, NC 27695-8605.

Front cover photo of beach elder ripening from green to yellow by Michael Halminski.

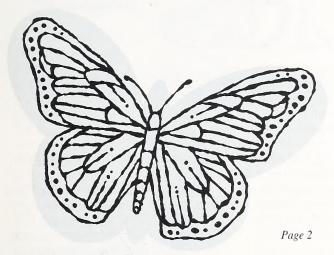
Inside front cover photo of estuary scene by Scott D. Taylor.

Printed on recycled paper by Highland Press Inc. in Fayetteville, N.C.





OCT 17 1995 table ofcontents







Page 14

Features

N.C. STATE LIBRARY RALEIGH

Cycles of Nature

As the season of summer ripens, a swash of color and maturity envelops the coastal landscape. To many, the onset of autumn unveils the year's finest view of the seashore. The fall migrations of fish, birds and butterflies and the brilliant hues of the marsh are the most visible. But you might miss the metamorphoses of the sea nettle and the lion's mane. Or the egg-laying of the knobbed whelk and marbled salamander. Coastwatch writer Rachel Wharton takes readers on a seasonal

North Carolina Dolphin Log: Volunteers On-Call

Staff writer Larisa Tatge looks at one of North Carolina's most alluring inhabitants — the dolphin — from an array of perspectives. First, she introduces readers to a group of folk who are willing to wake at all hours of the night for this allimportant marine mammal. The Marine Mammal Stranding Network is a cast of devoted, highly trained volunteers who'll drop everything to answer a stranding call. In companion stories, Tatge provides tips for watching dolphins from our shores, outlines the federal law that protects these creatures and describes a recent research project to tag and release

Limited Entry: **A Fisheries Management Option**

When the sale of new commercial fishing licenses came to a halt in July 1994, the state gave itself a two-year breather to take stock. Under the leadership of N.C. Sea Grant, the state is in the midst of a comprehensive examination of fisheries issues. Also under the microscope is a potential new management option known as limited entry. Coastwatch editor Kathy Hart describes the concept and illustrates its successful

Wetlands from Test Tubes

The solution to restoring wetlands may stem from the same technique that puts begonias in the garden and peace lilies on the patio. In the laboratory, Sea Grant scientists are rapidly multiplying native seagrasses and marsh plants in test tubes. Coastwatch editor Carla Burgess explains this powerful technology that may help repair and even improve marine

Departments

Coastal Commentary	.21
Aft Deck	. 22
Readers Talk	24

Cycles

By Rachel Wharton

It's autumn. The eye-squinting glare of summer eases as the sun crosses lower in the sky. The pavement ceases to sizzle. As the red and blue stars and stripes of awnings, bathing

suits and beach towels

are folded for the last time, nature's own glorious colors unfurl.

Although summer's fun (and sunburn) may be fading, the yearly rustle of fall approaches. Many feel it's the best time to be at the North Carolina coast.

"Along the shore, summer's frenzy of living activity matures to a season of storms, wildflower colors and the coming and goings of familiar seaside animals," writes naturalist Todd Ballantine in "Tideland Treasure." "As October breezes 'thru, and November nudges ever-nearer, the salt marshes explode with a frenzy of animal travel and the harvest of golden grains."

Jeannie Kraus often leads groups of schoolchildren on nature walks during this season. "The fall is really the best time to see plants and animals on the coast," says Kraus, an educator at the N.C. Maritime Museum in Beaufort. "There's more variety, and there's a little more color. Many animals have reached adulthood and

have had their young. It's kind of like the marsh comes to maturity."

Every fall, lavender, glasswort, asters and goldenrod flower, tinting the marsh purple, red, pink and gold.

In the maritime forests, deer, squirrels and foxes feed on the shiny berries of the yaupon.
Raccoon

lead to the marsh, where there are plenty of

tracks

crabs and mussels to eat.

Birdwatchers spy ducks, hawks, sandpipers and others as they migrate

south down the coast. Hunters take aim at geese on Lake Mattamuskeet, and fishermen wrangle with drum and speckled trout that feed in schools. Thousands of fish migrate south, passing by on their way to Florida or South America. Others leave the estuaries for warmer waters. Croaker and spot that matured in the estuaries grow large enough to head for the surf.

These changes are all part of the cycles of nature — cycles that still control our lives. Every year, winter melts to spring, spring warms up to summer and summer fades to fall. These seasons are brought on by the earth's tilt as it travels around the sun. As the world turns, day length and temperatures change. Plants and animals change too — adjusting and

preparing to continue their own cycles of life.

"In the fall, there's change, preparation, stress — a difference in the chance of survival," says Lundie Spence, N.C. Sea Grant's marine education specialist. "You've got some big-picture stuff going on. In the spring and fall, animals and plants get ready."

This September — as days inevitably shorten, leaves color and fall, and temperatures slowly drop — many coastal organisms will begin to move. They may travel 10,000 miles in search of food, search for places to lay their eggs, or burrow into the mud to hide for the winter.

Now our coast is continuing its patterns and cycles and phases and stages of life. And it's these seasonal shuffles that offer a chance for people to sit back and watch.

Egg-Laying and Seed-Sowing

Fast at work on estuary bottoms and tidal flats is the knobbed whelk. North America's largest saltwater snail. The knobbed whelk lays its eggs inside a stiff case that's designed to keep predators away. The egg case is a long, thin necklace of papery packets. These look like umbilical cords or a snake's shedded skin. Knobbed whelks lay two sets of eggs: one in spring and one in fall.

In the fall, you can find the whelk's egg cases dried up on the beach. Each segment contains hundreds of eggs that would have hatched tiny whelks had the case remained safe on the estuary floor. The whelks hatch inside the egg case, then chew their way out of the segments through a tiny hole at the top.

The knobbed whelk, which is named for the knobs on its spire, stalks the bottom of the estuary for clams, oysters and mussels. When it finds them, it pries their shells open and sucks the meat out with its radula, a rough band that holds tiny teeth.

The marbled salamander avoids predators, namely fish, by laying its eggs in shallow temporary pools throughout the Coastal Plain as well as the Piedmont. As the leaves turn red and brown, around September and October, these ponds come to life after lying dry during spring and summer.

The salamander eggs (covered with a slightly sticky skin) go into a "holding pattern," says Alvin Braswell, the curator of amphibians at the N.C. State Museum of Natural Sciences. This stage usually lasts for a few

weeks. When autumn rains come and fill up the pools, the eggs hatch and grow into 4-inch amphibians, black with irregular patches of gray or white.

How can the salamanders tell where dry ground will fill with water?

Braswell says scientists think the trick is the scent. The salamanders can smell the dried microcrustaceans and other organisms left in the soil from last year's pools. The advantage of this type of habitat, says Braswell, is the reduction in the numbers of predators. "Sites that dry up don't have a lot of fish," he says.

Although egg cases and salamander sites may pass each year unnoticed, it's easy to spot the colors of an **autumn** marsh. This change is caused by reproduction of another kind. In the fall, marsh plants go to seed. Tufts of yellow cordgrass seed fly off in the wind and cover the marsh, creating a hearty meal for mice, sparrows and waterfowl.

For marsh fish, millions of tiny insect eggs provide a winter meal. In the fall, mosquitoes,

midges and other marsh insects lay their eggs in the mud on the banks of the marsh. Sometimes the eggs float across the surface of the water, where they are snapped up by hungry fish. The eggs nestled in the mud will rest through fall and winter until they are sprinkled by spring rains.

"Fall is the time that many sexually adult species of fish come together to make their **spawning runs**, moving into the shallow waters around inlets to mate," says Jim Bahen, of the N.C. Sea Grant Marine Advisory Service.

That's when good fishermen take notice of big fish in large numbers.

"For an angler, it's the best time of the year," says Bahen. "Although the part-time fisherman may go deer hunting in the fall, the full-time fisherman is going to go after the speckled trout or red drum."

During the fall, scores of red drum and bluefish are caught off Cape Hatteras. Near the Outer Banks, where warm and cold waters meet, there are large concentrations of striped bass. Speckled trout spawn where coastal rivers meet the ocean. Maturing croaker, spot and summer flounder move offshore to winter spawning grounds.

Many fish migrate to spawn, but others are searching for food or warmer waters. Some king mackerel are here year-round; others migrate north in spring and south during fall to stay in waters no colder than 68 F. In the fall, some pelagic fish also head south. Fishermen can catch bluefin tuna, black marlin and billfish.

Moves and Migrations

In autumn, the estuaries are teeming with fish and the piers are elbow-to-elbow with anglers. But some folks can't take their eyes off the sky. From now until November, North Carolina will be visited by migrating songbirds, land birds, shorebirds, waterfowl, even hawks. From the Alaskan tundra, the Arctic, Canada and the Northeast they come, passing through on their way

Continued



the coast in the fall. The winds don't concentrate birds in the spring."

Some migrating birds claim
North Carolina as their winter home.
"If you're from northern Canada,
North Carolina seems like a great
place to winter," says Parnell. Every
year, Lake Mattamuskeet is visited
by 25,000 to 30,000 snowy-white
guests. From November to February,
the lake is home to the tundra swan,
from the Alaskan tundra and Northwest territories, as well as a small
flock of Canadian geese, snow geese
and thousands of ducks — both divers
and puddle ducks.

"The theory is that the swans used to winter in the Chesapeake Bay area," says Don Temple, refuge manager at Lake Mattamuskeet. "But the decline of submerged aquatic vegetation, the swan's primary food source, brought them here."

At Lake Mattamuskeet, the swans also feed on the surplus crops of winter wheat found in the area.

For Walker Golder, an ornithologist and photographer at Wrightsville Beach, there's more to birdwatching than what's in plain sight. "If you go out to the end of a pier and get away from the noise of the street," he says, "you'd be amazed at what you can hear — songbirds, ducks, shorebirds. A lot of people bird by ear more often than they bird by sight."

Although scientists can tell you

which species is which and when each is likely to come, they can't tell you why. Food availability is one of the factors many suspect cause migrations. "If you're an insect

eater, then all the food is gone in cold conditions," says Parnell. "If you're a seed eater, then all the seeds might be covered in ice."

Other birds may

move to escape cold, harsh winter weather. "Some may migrate because it's traditional to move south," says Parnell. "But in many cases, it's survival."

Whatever the reason, says Golder, "It's a great time to be out birdwatching."

Birds aren't the only passers-by in the fall. Look for the orange of the migrating monarch. Although the trickle of southbound butterflies begins in late summer, September is the peak. The flutterers move from northern breeding grounds south along the Atlantic Ocean.

The butterfly's migration is thought to be initiated by sudden temperature changes and a decrease in daylight hours. A butterfly will migrate if it can't withstand cold winters through hibernation. Instead it will move south, following the nectar of fall-blooming flowers and weeds. Although butterflies fly low, about 15 to 20 feet above the ground, they move higher when they come across large build-

ings or forests.

When temperatures
drop in the evening, the
butterflies roost on tree
branches. Monarchs prefer trees
with slender leaf partitions or leaf

segments that are deeply serrated, which are easier for their claws to grasp. The butterflies squeeze together in small clumps, and sometimes as many as 1,000 monarchs overnight on one tree.

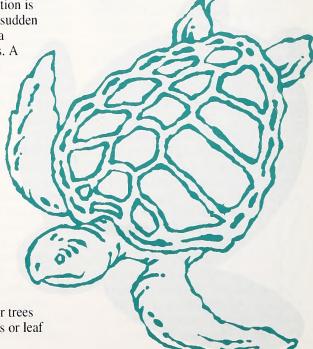
If the monarch kept flying through the night, its wings could paralyze with the cold. The butterfly would fall to the ground to be eaten by beetles, ants or mice.

Some monarch females begin migration before laying their eggs. These butterflies often leave the green caterpillar pupae scattered en route.

Rests and Hibernations

Many await the fall as **turtle- hatching season**. On chilly autumn
nights, the curious wait to spy loggerhead sea turtle hatchlings crawling en
masse to the ocean. Back at the marsh,
turtles are also hatching. Tiny diamondbacks break from their shells, dig out of
their nests and head toward the waters
they've never seen before. There, like
most land turtles, they will search for a
place to spend the winter hibernating
— buried deep in the mud.

"The diamondback terrapin would follow this pattern," says Braswell, "but the yellow-bellied slider turtle's young might stay in the nest."



In a process called "overwintering," some baby land turtles stay in the nest all through fall and winter. Although the turtles may hatch, says Braswell, they won't leave the nest. Instead, they feed off the yolk material left from their eggs and let their metabolisms slow.

On the seafloor, the jellyfish settles down to wait. For the sea nettle, a jellyfish found in all saline waters of North Carolina, life begins

as a larva. By the late fall and winter. these

> have settled to the bottom of the ocean and formed polyps.

larvae

A polyp is the waiting, benthic or bottom — stage of the jellyfish's life cycle. If temperatures get too cold, the polyp can squeeze into a cyst, waiting for the weather to warm. Each polyp can produce more polyps, or it can break into thin saucerlike divisions. In the spring, each saucer slowly floats to the surface, popping up as the bell-shaped, many-tentacled "medusa" that sends swimmers screeching.

North Carolina has nine types of jellyfish and two comb jellies. Although most have a polyp stage and a medusa stage, these stages vary from season to season. Although the sea nettle lies low as a polyp in late fall and winter, the lion's mane rises as a medusa. The cycle depends on what

type of wind, waves, temperature and food each jellyfish prefers.

Oysters also take a break. All summer ovsters have been spawning - pumping out billions of oyster

larvae. In the fall, they begin to lay in fat for the winter and add to their shells. Fall and winter are prime times for oyster harvests, as the oysters get

fat and tasty. In the summer, the oysters use up their fat stores as they begin to spawn again and become more watery.

Most folks associate hibernation with bears, but bumblebees do it too. In the late summer or fall, queen bees seek a sheltered place to spend the winter. They hide in cavities of old walls, under fallen logs or moss, or an inch or so underground.

After mating in late summer, the bumblebees stay in their hideaways until the next spring. This period can last as long as nine months. Because the queen bee stays hidden longer than the average winter hibernation, her beauty sleep is correctly called a diapause.

Unlike honeybees. bumblebees form new colonies every year. Throughout the spring and early summer, the queen bee has been laying eggs. These hatch into worker bees males and females that gather food and tend to the queen. Around midsummer, the bumblebee queens "stop producing worker bees and start producing reproductives," says Stephen Bambara, an N.C. State University entomology extension specialist.

"Reproductives" are the bees that will mate. After mating, the large females, or queen bees, will diapause. The males, remaining workers and even older queen bees will eventually die off. Next spring, the new queen bee will lay her eggs and begin building a new colony all by herself.

Another insect in hiding this fall is the spider-killer wasp. Throughout the summer, this big bug catches and paralyzes spiders. In the fall, the wasps lay their eggs on top of the spiders in a sand dune burrow. When the eggs hatch, the immatures survive the winter in the burrow, feeding on the spider. Adult spider-killer wasps spend the winter underground or in their own



burrows.

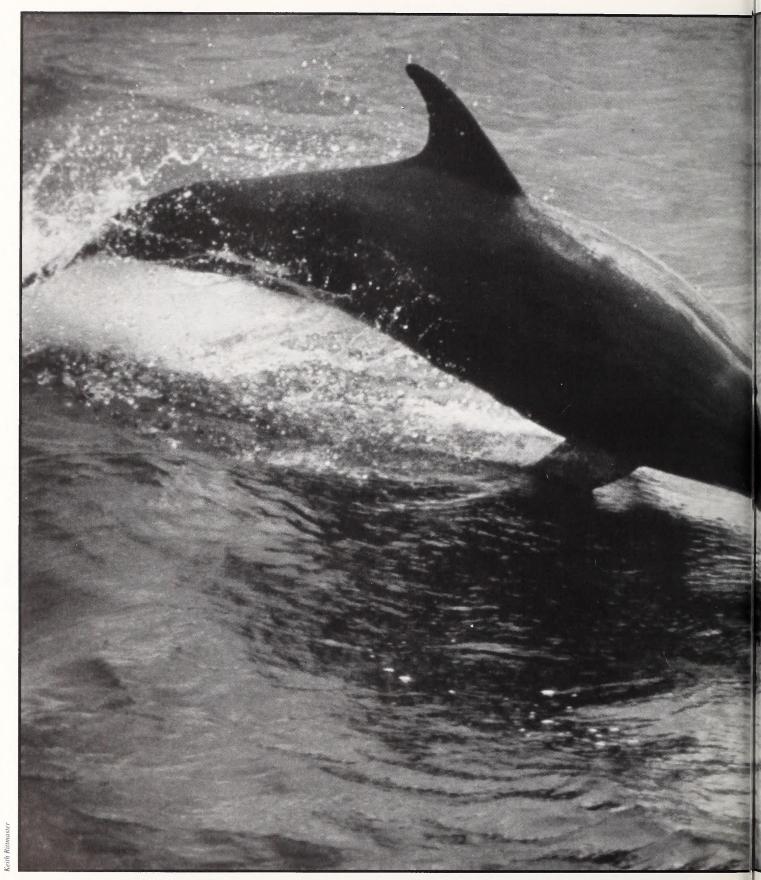
6

In 1947, naturalist and Pulitzer prizewinner Edwin Way Teale and his wife Nellie began the first of four trips around the United States. These trips were

arranged by the seasons. In 1956, Teale published the second of four books resulting from those trips: Autumn Across America.

"These are the seasons of

constant change," writes Teale. "Like dawn and dusk they are periods of transition. But like night and day and day and night they merge slowly, gradually.'



Bottlenose dolphin



North Carolina Dolphin Log:

Volunteers On-Call

By Larisa Tatge

About 100 times a year, a sick or dying dolphin strands on North Carolina's shores. When it happens, only a handful of North Carolinians are equipped with the marine mammal know-how and authorization to step into the crisis. Many are members of the Marine Mammal Stranding Network (MMSN), one of the longest-operating rescue efforts involving dolphins in the state.

The network's mission is twofold: to protect humans from potential danger posed by stranded mammals and to systematically gather data that could lead to new insights about marine species. The media-drawing nature of the work, however, also requires a dose of crowd management and media relations skills.

It's all part of a nonpaying job that is often cold, wet and "grungy," volunteers say.

"We mobilize immediately. What's critical is to get to the animal as quick as possible," says Andy Wood, curator of education at the N.C. Aquarium at Fort Fisher and 11-year veteran volunteer for the MMSN.

Wood and about 30 other volunteers are on-call around the clock, prepared to respond to a stranding report in the wee hours of morning or late at night. Sometimes the search for a stranded mammal is an arduous task, involving long drives down the coast. In addition to dolphins, volunteers home in on reports of stranded whales, seals and sea turtles.

Claire Hohenwarter, a five-year network volunteer and veterinarian from Wilmington, says that many reports come just after sunrise.

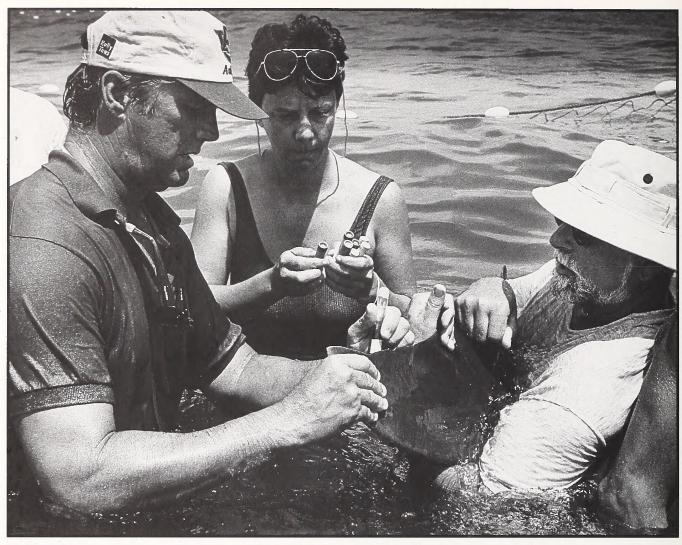
"Usually people see the animal early in the morning when they're walking along the beach," she says.

Dolphins may beach on the shore for a number of reasons, but two scenarios are most typical, says Wood. The dolphin may have died from natural causes such as old age. Or it may be injured or sick and is trying to avoid sharks or breathe easier in shallower water.

In any case, anyone who encounters a stranded dolphin should immediately contact the police. Do not touch or try to move the mammal, Wood warns.

Besides being dangerous, approaching a beached dolphin is illegal. The Marine Mammal Protection Act prohibits nonauthorized contact with stranded marine mammals.

Continued



Researchers take a blood sample from a bottlenose dolphin in North Carolina this summer.

Don't push it back out to sea, says Wood. The body will probably wash up again farther down the beach, and, if the stranding has been reported, it makes it that much harder for a MMSN response team to do its job.

Scott D. Taylor

Many people don't realize how easily a dolphin in distress can inflict injury, says Wood. "When a dolphin is flipping its tail around and flailing, it could break a person's neck or smash their face. It sounds melodramatic, but that's the truth of it. It's like being kicked by a horse."

There is also potential for disease transmission, which is why volunteers take special precautions when working with the mammals. The measures are part of a strict protocol established by the National Marine Fisheries Service (NMFS) under the National Oceanic and Atmospheric Administration. MMSN volunteers meticulously follow the procedure as they collect blood samples, tissue samples and other steps in a necropsy, an animal autopsy.

"There's a finite number of people in North Carolina who can handle marine mammals. Just because you're interested in them, doesn't mean you can handle them," Wood says. To join the network, potential volunteers must apply through NMFS and, if accepted, receive further training.

A beeper helps network coordinator Vicky Thayer monitor latenight stranding reports, which proliferate at certain times of the

year. "In the spring, I get five to six calls a week at home," says Thayer, who works for NMFS. "Spring is really busy."

There have been no successful releases of live dolphins in North Carolina, Thayer says. Successful releases most often occur in cases of mass strandings, which have happened infrequently here.

"Most of the animals that strand are sick; they're going to die anyway," explains Dan O'Dell, volunteer scientific coordinator for the Southeastern Atlantic-Caribbean MMSN. O'Dell's job includes tabulating a data base for the region, which stretches from North Carolina to Texas and includes Puerto Rico and the Virgin Islands.

Based at Sea World in Orlando, Fla., O'Dell jokingly calls his job a "freebie."

"The network is all-volunteer," he says. "There's virtually no money in it.'

Before the national and regional networks evolved in 1977, stranding volunteers often worked independently along the coast, he says. Today, they are more organized, publishing a seasonal newsletter that is funded by NMFS.

But the network faces one everpresent hurdle: lack of funding.

To operate efficiently, stranding networks need logistical equipment such as machinery for hauling mammals, foul-weather gear and medical supplies. They also need special field equipment for collecting, analyzing and storing specimens and data. Finally, they need places to archive that data.

"But nobody's putting up the money. That's been a real stumbling block," O'Dell says. The dearth of government funding belies the instrumental role the network plays in supplying "ultrafresh" data in times of crisis. In 1982, the network was able to provide archived tissue samples that helped identify mobilivirus, a disease linked with a mysterious dolphin die-off in Florida, O'Dell says.

"One of the important aspects of the network is gathering long-term historical data," he says. "We can then identify a crisis when it happens. Samples that we've collected in the past are starting to pay off."

North Carolina is in a unique position among other states in the Southeast because some volunteers are able to incorporate their MMSN work with their "real" jobs, he says. For example, part of Thayer's job description at NMFS is coordinating the state's network. Volunteers in many other states don't have that advantage.

"That's very positive," O'Dell says. "As the federal government wants more and more information on strandings, the only way to do it is to have dedicated people and the resources."

But North Carolina is not unique in the challenges created by widespread coastal development. As the state's coastline becomes increasingly populated, some people wonder what price the dolphin population will pay.



The same types of human activities that threaten other wildlife species may have a similar impact on dolphins. As people stream to the beaches, they bring more deadly marine debris, more noisy boat traffic and more habitat-disturbing tourist activities.



O'Dell, Wood and others are optimistic that more people on the beach will mean more frequent and timely stranding reports, which will provide useful information about dolphins. They also believe there will be more organized research efforts.

But there will be a downside.

The same types of human activities that threaten other wildlife species may have a similar impact on dolphins. As people stream to the beaches, they bring more deadly marine debris, more noisy boat traffic and more habitat-disturbing tourist activities.

Boats pose a double hazard. Not only can they injure dolphins with the churning blades of their propellers, they may interfere with dolphin communication, Wood says.

"They create atmospheric noise that can lead to confusion," he says. "A mother and her newborn calf may not be able to communicate. It's like trying to talk to someone and standing next to a freeway."

Human contact is linked to about half of all marine mammal deaths that occur in North Carolina. Between Jan. 1 and March 8 of this year, 26 marine mammal strandings were documented, according to a newsletter published by the Southeastern Atlantic-Caribbean MMSN. Eight of these strandings were bottlenose dolphins with missing fins, fresh net cuts and net entanglements. One was stranded with fishing gear attached, and one was shot.

Network volunteers say the public is slowly becoming more aware of laws and issues involving dolphins. Their hope is that the number of human-related dolphin deaths will drop as awareness spreads. And because of recent media exposure, the network itself is becoming more visible in the state a trend the volunteers welcome.

A stranding report is one wakeup call volunteers do not mind answering, no matter what the weather. The sooner a stranded dolphin is reported, the more likely telling clues about dolphin life will be found.

Researchers Study

Bottlenose dolphins are common in North Carolina, particularly in the fall, when clusters of their shiny steelgray dorsal fins can be seen cresting the water as they journey toward warmer zones.

Even though dolphins are highly visible, scientists say research on the bottlenose in North Carolina had been limited until July of this year. That's when 54 scientists converged along the coast for a 12-day live capture project sponsored by the National Marine Fisheries Service.

"It was the first time dolphins had ever been captured for scientific research in North Carolina," says Gail Cannon, Duke biologist and participant in the project. "We were very happy with the results."

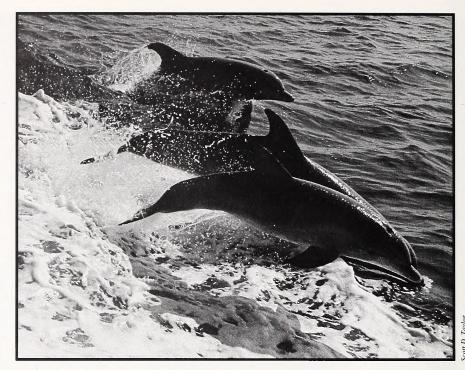
Thirty-one dolphins were captured, studied, tagged and released with the goal of assessing the health of the population, as well as trying to understand their migrational patterns.

Prior to the project, state researchers relied on photo identification projects and data collected from strandings to study dolphins, Cannon says. Although these sources can shed light on factors that underlie dolphin mortality, they don't provide the invaluable data of a live capture.

"A live capture gives you a more accurate look at what the animal is experiencing," says Patricia Fair, physiologist at the Southeast Office of the National Marine Fisheries Service (NMFS) in Charleston, S.C., and project participant.

Because the body tissue of a dead stranded animal is often degraded, it's sometimes difficult to take correct measurements and gather other types of information, she says.

In the NMFS project, basic data were collected and dolphins were tagged by suction cup or with small pins in the dorsal fin. Others were tagged with radio tags, so they could be tracked over the airwaves. No permanent tags were used in the onetime project.



A pod of dolphins becomes airborne.

Dolphin Behavior

variety of dolphin species roams North Carolina's waters, but the bottlenose is the species most often seen from the beach. Other types of dolphins found in the state include spotted, spinner, striped, roughtoothed and Risso's dolphins. Some locals mistakenly call these mammals porpoises.

Real porpoises are usually found in colder waters to the north, although they occasionally stray south. The harbor porpoise is the most common porpoise species documented on the East Coast. It is beakless and smaller than a dolphin — about 5 feet long with a dark brown, black or dark gray body and a light-colored underside. Harbor porpoises tend to stay in shallow coastal waters, rarely swimming into the deep sea.

Bottlenose dolphins grow seven to 12 feet long, cruising through the water at speeds up to 20 mph. Their bodies are streamlined by a smooth casing of blubber that envelops their flexible skeletons like a rubber glove.

This dense coat of blubber allows warm-blooded dolphins to maintain

their body temperature in cold water temperatures, as land mammals do with hair or fur. Unlike mammals such as cats or dogs, which produce large litters, dolphins typically bear a single young after a gestation of about 12 months.

The 80 to 88 conical teeth that line the dolphin's bottle-shaped beak help it grab food and devour it whole. Dolphins, which mainly feed on schooling prey, hunt in groups of up to 100 called pods. In this way, they can search a wider area for prev and can combine their expertise to locate food faster.

With a far-reaching repertoire of squeaks, whistles and clicks, dolphins transmit signals to each other. And they navigate through an echolocation system. This system — which functions much like the radar system of a bat also enables the dolphin to pinpoint food and explore its ocean surroundings. The conical teeth are part of the receptors for echolation.

Unlike fish, dolphins and whales must periodically rise to the surface for a dose of oxygen. Fish can extract oxygen from water through gills, but cetaceans have lungs. Through the

Unlike fish, dolphins and whales must periodically rise to the surface for a dose of oxygen. Fish can extract oxygen from water through gills, but cetaceans have lungs. Through the blowhole on the top of their heads, they expel an audible cloud of steam and quickly inhale fresh air.

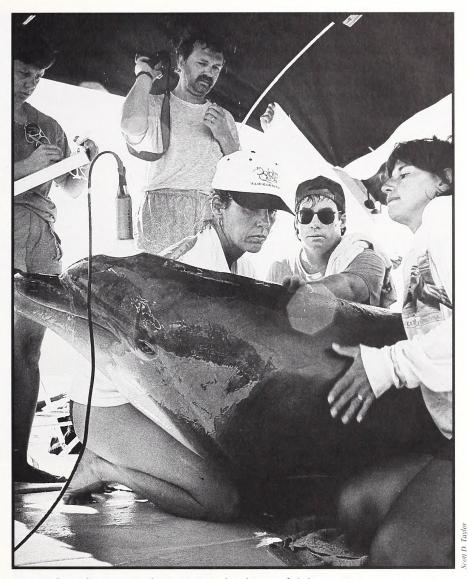
blowhole on the top of their heads, they expel an audible cloud of steam and quickly inhale fresh air.

Some bottlenose dolphins are residents of North Carolina's waters; others pass through during seasonal migrations. The meeting of the Labrador and Gulf Stream currents along the state's coast encourages an influx of pods from the north and south. These currents mix to create a rich oceanic food supply. Estuaries are also rich in food. Many dolphins consume mullet and other fish in the state's sounds.

In temperate regions, such as North Carolina, bottlenose dolphins are classified into two geographical groups: coastal and offshore. Coastal dolphins can be found year-round, although fall is the harbinger of a dolphin influx.

"In early October along the Outer Banks, if you're there on the right day, you can see dolphins going by all day long," says David Lee, curator at the N.C. State Museum of Natural Sciences.

If you're dolphin watching, it may be possible to identify several common behaviors, says Andy Wood, curator of education at the N.C. Aquarium at Fort Fisher. He describes bottlenose dolphins as playful crea-



Researchers do acoustical testing on a bottlenose dolphin.

tures, although less so in their natural habitat than portrayed by the media.

"The television show 'Flipper' was glorified dolphin behavior," he says.

- **Porpoising.** This term refers to a method dolphins use to hunt as a pack. Dolphins come to the surface in a circular pattern at rapid rates of speed. By encircling groups of fish, the dolphins corral them and then take turns feeding.
- Jumping. Dolphins often leap into the air and land with a loud slap on the water. This could be a form of play or the dolphin "may be trying to get a look around and see what's

going on," says Wood. It's also possible that the loud slapping noise is a form of communication.

- Tail flips. With the strength and finesse to leap up to 10 feet out of the water, dolphins often punctuate a dive with an acrobatic flip of the tail.
- **Spinning.** Spinner dolphins are aptly named for this feat - spectacular spins that propel them upright on the axis of their tails.
- Surfing. Called "nature's bodysurfers," bottlenose dolphins can sometimes be seen surfing the waves and wakes on their slick, streamlined bellies.

Continued



Scientists Andy Read (left) and Joe Ramus release a bottlenose dolphin after testing.

• Driving and foraging for fish.

These are two other strategies dolphins use to capture food. Sometimes dolphins will drive schools of fish completely out of the water and then slide onto the shoals to devour them. They also forage behind fishing boats for the organisms disturbed by the nets.

No matter how fleeting, a dolphin encounter can be intriguing, leaving you yearning to know more about this creature that has interested beachgoers since the time of Aristotle.

One way to remember and learn from what you've seen is to keep a personal journal, says Lundie Spence, N.C. Sea Grant's marine education specialist. Don't just describe what you see — draw or sketch it. If you frequent the same area on the beach, a journal may help illuminate any changes in dolphin patterns that occur from season to season.

If you're an able photographer,

consider keeping a photographic log. In some instances, dolphin photos taken by amateurs may be useful to researchers who are involved in identification projects. If the shots are focused enough to help identify a dolphin and are accurately dated and documented, they will add to dolphin data, says Keith Rittmaster of the N.C. Maritime Museum. Keep in mind, however, that harassing a dolphin is illegal, so photographing from the beach will keep you within the limits of the law.

Once a year, Rittmaster meets with other researchers along the coast to compare photographs, which are used to identify individuals, he says. "It's exciting to see the resights."

Photographed dolphins are given names and numbers, such as "Holly" #80, which has been spotted in North Carolina almost every summer since 1989. Holly sports a distinct notch on her lower dorsal fin and is believed to be an adult female since she often travels with other dolphin females and calves. Holly is often acompanied by "Cutty" #75, a female missing the top portion of the dorsal fin.

Finally, consider attending a dolphin workshop. The N.C. Maritime Museum sponsors two weekend workshops each year on dolphin biology and behavior at Cape Lookout. A separate workshop is offered for children each summer. Funds generated from both programs help pay for equipment for dolphin research projects, Rittmaster says.

The Duke University Marine Laboratory also offers a summer course on marine mammals. It has the prerequisite of an introductory biology course at the college level.

Whether you keep a journal, snap photos, attend a workshop or merely observe, your dolphin encounter will become more meaningful if you reflect on the experience.



Protection for Dolphins:

Laying Down the Law

Loday, dolphins and other marine mammals are protected from human harm and harassment in the United States by the Marine Mammal Protection Act (MMPA). Established in 1972,

the MMPA protects dolphins from being taken or harassed. The law also prohibits human contact, except by people with special permits. Enforcement of this law is carried out by the National Marine Fisheries Service, a branch of the National Oceanic and Atmospheric Administration (NOAA).

Since the law was implemented, only about 500 permits authorizing individuals to handle marine mammals have been issued, says Kevin

Collins, legal adviser for NOAA in Washington, D.C.

Meanwhile, the definition of illegal dolphin "taking" has also been expanded to cover "capturing, hunting, killing or harrassment and feeding," he says. "That includes any restraint or detention of a dolphin, chasing with a boat or negligent operation of a boat."

The legal focus on boats stems from one of the latest threats to dolphin survival — the tourism industry, according to Collins.

"Feeding cruises are springing up everywhere," he says. Although this practice hasn't been challenged, it may verge on harassment, says Lundie Spence, N.C. Sea Grant's marine education specialist. Feeding a dolphin a food or nonfood item can be harmful because it disrupts natural migratory patterns and creates dependence on human-supplied food, says Collins.

There is a steep price to pay for



Scott D. Taylor

breaking the law, Collins says. Violating the MMPA subjects people to civil penalties of up to \$20,000 per offense and up to one year in jail.

Another potentially harmful but growing tourist activity is "swim-with-the dolphin" programs, which operate in states other than North Carolina, such as Hawaii and Florida. Although the programs are designed to educate the public on marine mammal issues, some environmentalists say they constitute harassment. Critics also complain that the programs coax people into believing that dolphins kept in lagoons or tanks behave like dolphins in the wild and that it is acceptable to keep them in captivity.

At times, the idea of harassing a

dolphin seems as nebulous in the world of nature as it does in the human workplace. However, the MMPA specifically defines harassment as: "any intentional or negligent act which

creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns."

The fundamental problem is that it's not always easy to assess the impact human activities have on the behavior of dolphins and whales. Scientists have been unable to effectively link some human interactions with behaviors associated with disturbance. This means people have to exercise

careful judgment when they encounter a dolphin in the water to ensure that their actions may not be legally interpreted as harassment.

Some guidelines for boaters who encounter marine mammals include:

- When in sight of dolphins or other marine mammals, avoid excessive boat speed or sudden changes in speed or direction.
- Do not attempt a head-on approach to moving or resting marine mammals.
- If dolphins approach your boat, put the engine in neutral and do not reengage propellers until they are observed at the surface, clear of the vessel.
- Diving with dolphins or whales is considered to be an intentional approach and a violation of federal law.

Important Numbers

For information on dolphin workshops for adults and children at the N.C. Maritime Museum, call 919/728-7317. For information on Duke University's marine mammal workshop, call 919/504-7625.

By Kathy Hart

North Carolina fisheries are at a crossroads, and fisheries managers are pondering which management road to take.

More fishermen than ever have a commercial license to ply Tar Heel waters for the catch of the day — shrimp, flounder, blue crabs, mackerel, grouper, tuna and others. But the amount of catch netted by these watermen is declining.

For some species, it's simply a matter of too many fishermen dividing the amount of fish or shellfish available. That's the case with blue crabs. Blue crab populations are healthy, but the catch per crab pot is down because there are too many pots in the water.

For other species, stocks have declined. These declines are blamed on overfishing, poor water quality and habitat degradation. But the bottom line is this: There are less fish to fill nets and more watermen to catch them.

How do fisheries managers solve these problems? That's a tough question. They have to consider the resource, the people who make their living from commercial fishing and those anglers who cast a line for the sport of it.

To give themselves time to consider the possibilities, North Carolina lawmakers placed a two-year moratorium on the sale of new fishing licenses. And they provided the Fisheries Moratorium Steering Committee a \$225,000 grant administered by N.C. Sea Grant to study management options and to derive better data about people who fish within North Carolina's management jurisdiction — coastal rivers, sounds and ocean waters up to three miles offshore.

One management option that is sure to provoke consideration and debate is limited entry. In a limited entry system, resource managers limit the number of fishermen or vessels on the water, the amount of gear used or the quantity of fish caught. Ultimately, limited entry management seeks to maximize a fisherman's profit while also managing the resource.

LIMITED ENTRY:

A Fisheries Management Option

Other nations and states are already using this management tool. And at a recent conference organized by Sea Grant's Jim Murray, a series of experts — fishermen, economists, resource managers and academics — provided examples of limited entry management systems. They described how the systems were established, how they functioned, how they were changed in response to problems and what benefits they offered.

Frances Christy, a fisheries economist and noted author on limited entry, says limitations are a must in most U.S. fisheries. Without them, fishermen tend to overfish a species beyond the point that it can replenish itself by reproduction. Then stocks decline, economic waste occurs because of overcapitalization, and conflicts escalate among user groups.

In nonlimited fisheries, "fishermen operate in their own best interest," Christy says, often ignoring what is best for other fishermen and the stocks.

Miles Mackaness, a South Atlantic wreckfish fisherman, offers this example of his fishery before limitations. Wreckfish, a large, grouperlike fish, is caught by hook-and-line at depths up to 2,000 feet in the Atlantic. A few watermen pioneered the fishery in the late 1980s. Then the fishery exploded and fishermen flocked to it, hoping to make an easy dollar, Mackaness says.

Almost overnight, more than 100 large boats were leaving docks outfitted with expensive gear. Quickly, they glutted the market with catch, prices dropped and many went bankrupt because their expenses exceeded their revenues.

First, the South Atlantic Fishery Management Council tried to control the problems through gear and season limitations. But that didn't work, Mackaness says.

Then the council devised an allocated quota system. Managers divided the total allowable catch — 2 million pounds — among those watermen who could prove a history in the fishery. Fishermen were issued catch coupons for an allotted quota. They could use the coupons to fish or sell them to others.

As a result of the allocation system, the size of the fishery has stabilized, prices don't fluctuate as much, stocks are healthy and watermen fish when they please, no longer trying to outfish their competitors.

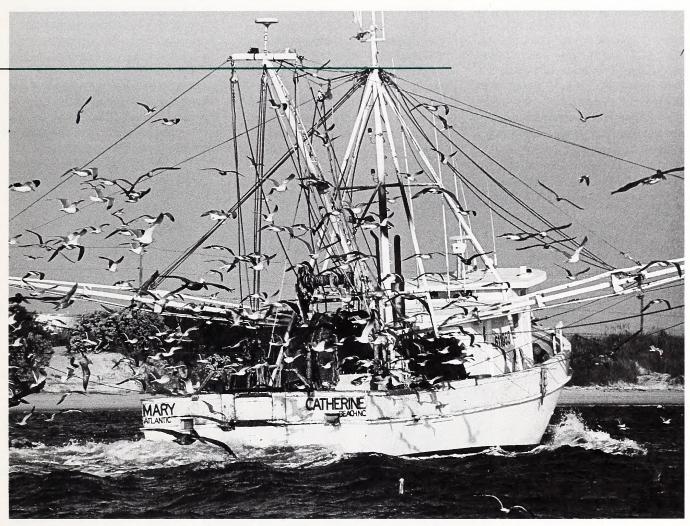
Now watermen have an ownership in the fishery and a stake in its future, Mackaness says. And that makes a big difference in how they approach fishing.

"It's very easy to maintain a stable business this way," Mackaness says. "People care more. They invest more in safety equipment; they care more about their crews.

"They care more about the resource," he says. "We put our own spawning season closure in. The government didn't have to tell us to do that. We wanted to do it for the stocks."

Christy agrees with Mackaness' assessment. He says limited entry has three benefits. It gives fishermen a reason to conserve the resource for the future. The sale of quotas, gear certificates or licenses produces revenue for the government that can be used to beef up management, enforcement and research. And it allows the marketplace to allocate among competing users.

The goal of limited entry, Christy says, is to limit government involvement and to allow fishermen the opportunity to manage themselves.



icott D. Tayle

"Some might say this is like putting the fox in the hen coop to guard the hens," he says. "But now, in the 'open' system, there's no coop, the hens are free-ranging and they're subject to predation not only from foxes but raccoons, skunks and others. The smart fox won't kill all the hens at once."

But whatever means of control that is used to limit a fishery must be transferable, Christy says. Fishermen must be allowed to sell their fishing rights or pass them to family members so that attrition doesn't occur.

Alaska began a limited entry system in the early 1970s when catches of salmon reached all-time lows, says Ben Muse of the Alaska Commercial Entry Commission (ACEC). Now, 52 of the state's fisheries have limited access.

In Alaska, the ACEC issues

permits to fish a specific species using a particular gear in a defined area. For example, a person who wants to catch salmon in Prince William Sound using a gill net has to buy a Prince William Sound gill net permit for salmon.

The fisherman must always have the permit in his possession when on the water, and the permit can't be used by anyone other than the fisherman to whom it's issued. This provision prevents large processors or corporations from buying permits and controlling the fishery — a common fear among commercial watermen.

Allocations of permits are made yearly and are based on catch records kept by the state fisheries managers. Fishermen must pay for their permits, sometimes tens of thousands of dollars for permits in high-value fisheries

where revenues can exceed \$1 million.

Like Alaska, Maryland had to face sharp declines in its most profitable fishery — blue crabs — to consider limited entry management. In 1992, crab catches reached a historical low, says Dave Blazer of the Maryland Department of Natural Resources (DNR).

"There were more pots in the water and more people in the fishery than ever before," Blazer says. "Crabbers were working longer and longer hours for the same amount of catch. Catch per unit of effort was way down."

The state had already tried gear restrictions, size limits, seasons and fees, but none worked, Blazer says. That's when the Maryland DNR decided to limit access in the fishery

Continued

through a combination of licensing restrictions and regulations.

Immediately the state placed a moratorium on the sale of new fishing licenses — just as North Carolina has done. Then the state devised a new license structure. First, fishermen were licensed according to gear, creating 23 types of gear licenses. But the system was too complicated and cumbersome for DNR and fishermen.

Finally, DNR licensed watermen according to species, creating seven types of species licenses. Fees for the licenses range from \$100 to \$300.

In the case of blue crabs, the crabbing license allows a waterman to fish 300 pots. And it limits fishing time to 13 hours a day — 3 a.m. to 4 p.m. For an additional fee, a commercial crabber can fish an additional 300 pots per crew member for a total limit of 900 pots. Fishermen can transfer their license permits among themselves at no cost. Usually they are sold as a package: boat, gear, permit.

In the Florida spiny lobster industry, fishermen played an instrumental role in the design of their limited entry system. Sea Grant researchers Mike Orbach and Jeff Johnson conducted workshop after workshop as they worked with lobstermen to develop a system amenable to fishermen and state resource managers.

Landings of spiny lobsters were constant, between 4 million and 8 million pounds yearly, but the number of lobster traps in the water had increased significantly. As in Maryland, the catch per unit of effort was down, says Jerry Sansom of the Organized Fishermen of Florida.

In addition, recreational anglers and boaters complained about the numerous lobster traps. They said the traps were damaging habitat. In Florida, where boaters and anglers number into the millions, even a whisper of complaint is heard loud and clear in the state legislature.

Florida legislators threatened action, but lobstermen asked for an

opportunity to offer a counterproposal, Samson says.

Florida lobstermen settled on a certificate program that limits the number of traps watermen can fish.

"Fishermen derived a formula for how many certificates each fisherman got based on historical catch information plus other factors," Samson says. Each certificate allows a waterman to fish 10 traps that must be properly



Nancy Davis

tagged with the certificate number.

Each year since the limitations were begun in 1993, the number of certificates issued has been reduced 10 to 15 percent. The number of pots in the water has dropped from almost 1 million to 570,000, Samson says. Lobstermen buy and sell the certificates among themselves, but no one waterman can own more than 1.5 percent of the overall certificates. Only individuals can buy certificates.

When the certificates are sold to fishermen other than family members, a surcharge is levied and a handling fee assessed. The state government collects these fees.

Fewer traps equate to less maintenance, smaller crews, smaller boats and

reduced costs, Samson says.

"Last year was our best year ever in the spiny lobster fishery," he says. "We've reduced costs while maintaining catch levels."

Florida fishery managers will continue to decrease the number of lobster certificates until they see a reduction in catch. Then they'll know they've reached the equilibrium between catch effort and sustainable yield.

In New Zealand, the government limits the catch of 32 species through a quota system called individual transferable quotas (ITQs), says Lee Anderson, an economist at the University of Delaware. Fishermen can catch a set amount, or quota, for a certain species. The quota is established by the government and based on the fisherman's previous three years of catch data.

If the sum of the quotas for all fishermen exceeds the total allowable catch needed to sustain that fishery, then the government buys quotas back from fishermen willing to sell. If too few fishermen sell, then all fishermen take proportional cutbacks.

New Zealanders also have a 10 percent over-and-under regulation, Anderson says. Fishermen can exceed their quota by 10 percent, but that percentage is deducted from the next year's overall allocation. If they catch less than

their allotment, they can add 10 percent to the next year's catch limit.

Although New Zealand made adjustments in the quota system to eliminate government red tape and to soothe disgruntled fishermen, "there is agreement by government and industry that they do not wish to go back to an unlimited system," Anderson says.

Mid-Atlantic surf clammers learned the same lesson, says Dave Wallace, a New Jersey surf clammer.

After the fishery collapsed twice because of overfishing and overcapitalization, watermen asked the Mid-Atlantic Fishery Management Council for limitations. The council placed a moratorium on new vessels entering the fishery and established a quota system that limits the catch to an amount that will allow the fishery to sustain itself.

Wallace says the quota system has lessened the industry's problems and placed control of the fishery back into the hands of the surf clammers. Before the limitations were enacted, the clam fishery was controlled by processors hungry to buy the clams for soups and chowders.

Many people were concerned that processors would buy a large portion of the individual quotas and control the fishery, Wallace says. One company tried it and lost \$200 million.

"Big companies don't have enough flexibility for the fishing business," Wallace says. "And they want too high a return — 20 to 30 percent — on their investment."

Is limited entry in North Carolina's future?

Probably so, says Bob Lucas, chairman of the N.C. Marine Fisheries Commission. Lucas says it's time for commercial fishermen to be treated as professionals.

"The idea is to put commercial gear in the hands of true commercial fishermen," he says.

He wants a commercial fishing license to carry a monetary and intrinsic value that provides fishermen a stake in the future.

"One of my goals — and it may seem a small one to some people — is that when someone asks me if his or her son should stay out of commercial fishing, I want to be able to say, 'No, tell him to get in it,'" Lucas says. "And I'm not going to be able to say that unless we get away from what we've been doing."

SPEAKING OUT ON LIMITED ENTRY

In a wrap-up to the Limited Entry Conference, a panel was assembled to discuss the possibilities of the management strategy in North Carolina.

Panelists included Jodie Gay, a commercial fisherman from Hampstead and a member of the N.C. Marine Fisheries Commission; Robin Doxey of the N.C. Crabbers' League of Aware Watermen (CLAW); Dick Brame, executive director of the state chapter of the Atlantic Coast Conservation Association; Bruce Freeman, director of the N.C. Division of Marine Fisheries; and Jerry Schill, executive director of the N.C. Fisheries Association.

Gay says Tar Heel watermen are frightened by the concept of limited



Sarah Friday Peters

entry because they don't know how it will affect them, their families and their method of doing business.

"This is a group of people who sleep offshore in boats, in thunderstorms, with 900-foot ships running them down," Gay says. "And ITQs scare them to death.

"We can deal with it," Gay adds.
"It's probably the management of the future. But it's my feeling that if we do it, we need to decide who is a commercial fisherman and let him fish."

Gay also stressed the need for flexibility in any limited entry management system developed by the state. Tar Heel watermen fish a variety of species, switching from fishery to fishery based on seasonal availability.

A limited entry system would need to accommodate fishing versatility, Gay says.

"The only thing constant in fishing is change," he says.

Doxey echoes Gay's concerns, but says "something has to be done." She calls for a more definitive definition of commercial fishing, adding that "for some, fishing is a livelihood."

Speaking for recreational anglers, Brame says his organization endorses commercial limitations for the sake of stock recovery and conservation.

"There is too much gear and too many people in the water," Brame says. "We've said for five years that we need to take commercial gear out of the hands of recreational anglers and put it in the hands of commercial fishermen. We need to professionalize this fishery."

Brame recognizes that recreational anglers share the blame for declines in some fisheries and appeals to resource managers to make sportsmen part of the process for solving the problem.

Freeman says the need for limitations is imperative given the rate of population growth in the state, especially in the coastal region.

Although the N.C. Fisheries Association hasn't developed a position on limited entry, Schill

says it will be important for all commercial fishermen to be involved in developing a new management strategy.

PROVIDING INPUT

Fishermen who want to discuss limited entry options in North Carolina can take part in a series of workshops being conducted by researchers Mike Orbach of Duke University and Jeff Johnson of East Carolina University. Based on a grant from the N.C. Fisheries Moratorium Steering Committee, the researchers are asking workshop participants to discuss which forms of limited entry might work in North Carolina.

For workshop dates and times, contact Orbach at 919/504-7606.

Wetlands

By Carla Burgess



Seagrasses are more closely related to water lilies than terrestrial grasses.

If wetlands are shedding their image as wastelands, then it's fair to say the plants that live in them are gaining stature as well. Once widely regarded as weeds, the plants that fringe marshes, dot dunes and wave underwater are coming into their own.

When wild celery and wigeongrass disappeared from Currituck Sound, so did the ducks, geese and other migratory birds that made the area a legendary waterfowl menagerie. Development, dredging, pollution and other

human intrusions have taken their toll on wetlands in other ways. Salt marshes have shrunk in acreage at the expense of many benefits: clean water, abundant fish and shellfish populations, and stable shorelines.

The result has been a growing appreciation for protecting these areas and a trend toward restoring and repairing damaged marine habitats. But how do you replace a seagrass meadow? How can you rebuild a salt marsh? It takes plants that you won't

find at the local feed-and-seed store.

In early restoration projects, biologists would collect plants from undisturbed areas and transplant them on the plot being created or restored. But when projects grew in scale, field collection began having negative impacts on established wetlands. Some states, most notably Florida, now limit the amount and types of plants that can be taken from the wild.

So where will plants for restoration come from? The solution may stem

How do you replace a seagrass meadow? How can you rebuild a salt marsh?

It takes plants that you won't find at the local feed-and-seed store.

Photo courtesy of Michael Kane

from the same technology that puts begonias in the garden and peace lilies on the patio. It's the science of tissue culture, also known as micropropagation or in vitro propagation. Whatever the name. it all starts with a piece of a plant in a test tube or other culture vessel. In contrast to the slow propagation of plants from seed or division. micropropagation can create hundreds, sometimes thousands, of healthy new plants in a matter of weeks.

In his lab at the Center for Marine Science Research at the University of North Carolina at Wilmington, Sea Grant scientist Kimon Bird takes small pieces of seagrasses and turns

them into bucketfuls of new plants ready for the bottoms of shallow bays and estuaries.

Anyone who has ever thinned a garden or produced a new houseplant from a cutting knows that plants continually renew themselves. They sprout, they divide, they cast off seeds, they send out runners. Micropropagation merely exploits basic principles of plant growth by stepping up the pace.

In the lab, scientists pamper the



Individual microcuttings of Pontederia cordata (pickerelweed) are rooted in the laboratory.

plants — clean them up, place them in a sterile container in a liquid or gel solution and put them on a special diet of nutrients. Then they add growth regulators to help nature take its course, albeit considerably faster.

"This nutrient solution provides all the nutrients and vitamins the plants need in order to grow," says Bird. "We also supply these tissues with what are called plant growth regulators that are somewhat analogous to animal hor-

mones. This causes the tissues to grow really fast and changes the growth patterns."

Under natural circumstances. such as with a houseplant, one shoot tip would produce one new plant.

"But by changing these different kinds of plant growth regulators, we can get 15 small lateral shoots coming out of this one tip," says Bird. In turn, each of these new tips can produce 15 more and so on. "This is a way of producing large numbers of plants from very small amounts of tissues."

Micropropagation became popular in the commercial arena during the 1960s, when scientists cultured

orchids in the laboratory to rid them of disease. In the bargain, they found that these slow-growing species of plants multiplied at breakneck speed in vitro. One bud could produce as many as 4 million plants in the span of a year.

Today, more than 40 percent of housepiants we buy from garden centers, florists and discount stores are derived from tissue culture. In a commercial nursery, growers can

Continued

culture in 10 square feet what once required 5 acres. Micropropagators also produce landscaping plants, fruit and ornamental trees and even agricultural crops. But this technology is relatively new in its application to repairing Mother Nature. Only three commercial laboratories in the United States are producing wetland plants for habitat restoration.

"There really is very little information on horticultural techniques for different kinds of marsh plants and seagrasses ... and this is what we're all about," says Bird, who has also helped develop a micropropagation procedure for several important dune species, including sea oats, firewheel and railroad vine.

"Seagrasses are particularly unique," he says. "They're really more closely related to lilies and some of the other water-type plants as opposed to being anywhere close to true grasses. Because they're so different ... we're finding that we may not always be able to take the conventional tissueculture approaches that a lot of plant propagators use.'

So Bird and a community of close-knit researchers on the East

Coast are developing their own formulas to suit the particular needs of these marine plants. Much of this work has been supported by the National Oceanic and Atmospheric Administration through Sea Grant and the Coastal Ocean Program's Estuarine Habitat Program. These agencies are investing in this research to fulfill their responsibilities to protect living marine resources.

One regional seagrass success story is Ruppia, or wigeongrass, which has already made the transition from test tube to turf. Tissue-cultured wigeongrass has flourished in Florida's Tampa and Sarasota bays and at sites near Beaufort, N.C. This real-world survival of tissue-cultured plants is a critical goal of micropropagators.

"They've been growing in this perfect environment, so to speak, where we provide them with exactly



Sea Grant researcher Kimon Bird examines seagrasses with graduate student Jennifer Woodhead.

the kind of light they want, all the energy they need and all the chemicals they need," says Bird. "And now we're asking this prima donna, if you will, in a test tube to go out and cope with all these hardy plants that have been battling it out there in the sediments and the tides for a long time."

So micropropagators add an acclimation step, during which plants are gradually weaned off their pablum, nudged into natural light and forced to photosynthesize or manufacture their

own food. Depending on the species, scientists also change the culture environment to encourage root production.

With a complete plant in hand, researchers must then decide how to best get it securely in the ground. Bird and his colleagues have explored multiple methods for seagrasses from metal staples that steady plants

> in the mud to weighted, biodegradable mesh bags and standard horticultural media such as peat pots. Lately, researchers are finding success with coconut-fiber mats to which young plants are attached by hairpins.

"When you really get down to it, so far restoration has been kind of trial and error," says Bird.

But the strides made up to now are promising. Ultimately, micropropagation technology will reduce the number of plants harvested from the wild and may provide an abundant, healthy and low-cost source of vegetation for restoring marine and freshwater habitats.

Scientists in Delaware are even developing strains of marsh plants with specific traits for

restoration. For instance, some of these plants could help detoxify contaminated sediments and polluted

With dune species, researchers are exploring intriguing agricultural applications. Dune plants thrive in a harsh marine environment, not so different in character from some farm fields. Using tissue culture, researchers may be able to engineer more forgiving varieties of crops.

"Dune plants have genes that are really good for tolerating salt spray,"

says Bird. "They live in sandy soils that have almost no nutrients. You have whole groups of plants that have learned to grow and flower and reproduce fairly well under what are pretty crummy conditions.

"These are the kinds of conditions that a lot of agronomists would like to start trying to adapt plants for so that in regular agriculture, we don't need

to use so much fertilizer. Or we can use brackishwater wells in western states where the wells have now gone from freshwater to brackish in nature."

Disease resistance is another benefit of tweaking the genes of marine plants. John Gallagher and Denise Seliskar, Sea Grant scientists at the University of Delaware, are developing more hardy varieties of dune plants for the Eastern Seaboard. For example, American beachgrass is the major stabilizing plant on ocean dunes of the mid- and North Atlantic, but it is highly susceptible to disease caused by pathogenic nematodes. Through in vitro selection, the botanists are trying to isolate nematoderesistant plant lines. They are also tinkering with a more coldtolerant strain of sea

oats, which are less susceptible to nematode attack. Sea oats are naturally concentrated along the Southeast Atlantic and Gulf coasts, but Gallagher and Seliskar hope to extend the species beyond its northern range. They have planted a genetically manipulated crop of sea oats on a dune at Broadkill Beach, Del., that has survived for five winters.

Although mutations occur and are even encouraged in some research, micropropagation is generally considered a "true" method of

replication. Through this vegetative or asexual process, culturists produce genuine clones that are identical to the donor or parent plant. Whether the goal is a homogenous supercrop of leafy Boston ferns or stands of sea oats with extensive root systems. standard tissue culture can produce it.

The possibilities are tantalizing. But the implications and concerns are



Micropropagated pickerelweed, a freshwater wetland plant, blooms in the field.

multiplying as fast as the plants. Some ecologists worry about the use of cloned plants to restore the environment; they are uneasy about a possible lack of genetic diversity in replanted seagrass beds and marshes. Others argue that we don't even know what level of diversity exists within native populations.

Again, scientists are scrambling to provide answers.

Through genetic mapping and DNA fingerprinting, researchers are trying to paint a picture of the genetic diversity that exists in the wild.

Just as a group of people in a room show differences in inherited eye color, height, body proportions and metabolism, individual plants within a habitat can also show variation, says Bird. The accumulation of these differences is the amount of genetic diversity that occurs within a species.

> Early data showed little genetic variation within seagrasses and other wetland plants, but the powerful lens of biotechnology is beginning to provide better resolution, Bird says. Restoration biologists and tissue culture scientists anxiously await the results of these genetic analyses. Once they understand how much diversity is present in wetland plants, micropropagators can aim to develop multiple lines of genetically different plants in culture. The result may be an extensive library of replacement plant stock appropriate for a wide range of restoration.

But with all its potential, micropropagation is not creating "roboplants" completely immune to the ravages that have

weakened marine environments in the first place.

"Until we correct the ecological causes of habitat loss, we're not going to be able to restore the habitats and have them remain," says Bird. "And so this is going to have to be the first real goal of any kind of long-term management of our bays and estuaries.

"It's a tough battle, but we have to keep pointing out that there's tremendous value — tremendous economic value — in all of our wetlands."

Felix Gets a Rise Out of Vacationing Editor

Where does the managing editor of *Coastwatch* go for vacation?

The beach, of course.

People always ask why I don't escape to the mountains or elsewhere when it comes time for a few days of rest and relaxation. Sometimes I do, but I least once a year I must spend a few days along the North Carolina coast.

The rhythmic crashing of the surf somehow erases all the days when the phone rings nonstop, the laser printer won't work, the color on the booklet just delivered from the printer is two shades off the one specified and my boss casually mentions that he has AN-OTHER new project that has to be on the streets tomorrow.

There's something inherently soothing and timeless about the eternal roll of beach waves and the rise and fall of the tides. The urgency I face most days slips away and is replaced by a more laissez-faire attitude of "It'll still be there tomorrow."

This year, we packed the car with everything from stuffed animals to cans of X-men noodles and headed to Topsail Beach for a week.

Our rental cottage was perfect — plenty of room for children, parents and grandparents. The kitchen was fully equipped, a washer and dryer were neatly hidden in a second-floor closet and the air-conditioning worked efficiently. We could see the ocean and the sound from the top deck, and we were only a half block west of the nearest beach access ramp.

It was all I could ask for and more.

I was anxious to delve into the bag of books and magazines that I had squirreled away in my canvas tote.

Finally, I would have time to read good fiction, ponder the appeal of new recipes, drool over glossy pictures of color-coordinated perennial gardens

and determine if there really was such a thing as a "trend" in fall fashions.

But there was a hitch.

A hurricane named Felix was churning the Atlantic Ocean southeast of Cape Hatteras, and forecasters were saying its path put it on a collision course with the North Carolina coast.

North Carolina hasn't looked a hurricane squarely in the eye in almost



Scott D. Taylor

30 years, and Felix picks my one week of vacation to come calling. The audacity. I was mad.

As I hit the beach at full stride, ready to walk off my anger and frustration at the possibility, I quickly noticed the vulnerability of South Topsail Beach.

In some areas, there was virtually no dune between the ocean and the first line of houses or road. In other places, a hill of sand had been pushed from the beach to sit at the base of beachhouse porches or pilings. The sand was not anchored by beachgrass, sea oats or any other plants.

My Sea Grant knowledge, thanks to coastal erosion specialist Spencer Rogers, told me a few good waves and a minimum storm surge would wash that hill of sand away in minutes. Already, high tide was pushing water to the base of the dune.

Behind the man-made dunes, a line of 50 or more houses stood at

attention like 18th-century infantrymen. An odd assortment of flags flapped from their decks, silently proclaiming the houses ready for battle.

But I knew that these houses, built ever so close to the ocean, would be easy targets for the first volley of wind and waves that Felix might fire.

It was sad to think that a single storm might wipe away so much. But it

is also foolhardy to build so close to an ocean so powerful. Why can't we give the ocean some space instead of parking ourselves in its face?

Recently, I traveled to Minneapolis — the land of the lakes. Several lakes were encompassed within the city's boundaries. City officials and residents had resisted the urge to build houses along the shores of these lakes. Instead, they opted to rim each with greenways and parks. Any housing sat behind roads that

formed the outer boundaries for these public access areas.

Why can't we do the same with our beaches in North Carolina? Why not leave the first 200 to 300 yards of oceanfront vacant of housing? It would improve beach access, provide a view of the dunes and ocean unmarred by buildings and offer a small measure of insurance from hurricanes named Felix and Hugo.

I know this is wishful thinking, that real estate rules over common good and the dollar can buy anything — except maybe an alternate course for a hurricane.

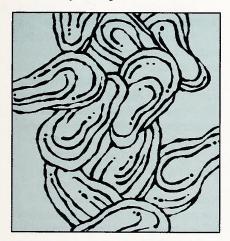
Alas, Felix knocked but didn't come calling. My thoughts slipped from thinking about beachfront development to pondering the choices for dinner and deciding the next book to pull from my tote bag.

No big storm huffed and puffed and blew the houses down. But it could have.

Kathy Hart

Oysters Offer More Than a Meal

For more than five years, N.C. Sea Grant has been developing a method of oyster culture called the chub system where oysters grow in floating mesh containers. This innovative technique may offer a boon to the oyster business. But these shellfish are valuable in many other ways. Here's what two Wayne County Community College students found



when they volunteered for a Sea Grant mariculture demonstration project.

A myriad of creatures was living in or around the chub. Growing amongst the oysters were shrimp, blue crabs, pinfish, oystertoads, sheepshead and skilletfish, schools of mullet and killifish, sponges, marine worms, sea squirts, seaweeds and a 3 1/2-inch spiny lobster. Inside the chubs, two dozen bay scallops were growing with the oysters.

Yet oysters do more than attract other beneficial organisms. They can reduce the amount of algae in the water. Theoretically, a single oyster can filter 25 to 50 gallons of water a day. That may not seem like much, but theorists say that enough oysters grew in the Chesapeake Bay at the turn of the century to filter the entire bay in three to five days. The numbers of oysters left today take almost a year to accomplish the task.

Although oyster mariculture is in its infancy in North Carolina, the Blue Ribbon Advisory Council on Oysters will issue a report soon on its study findings. One of the recommendations is to encourage oyster farming. And the benefits to the coast and the public may be greater than the economic value of the oysters produced. For more information, contact Skip Kemp, Sea Grant's mariculture specialist, at 919/247-4007.

Innovative Stream Repair

Residential and urban streams are degraded throughout the nation. A broadening landscape of impervious surfaces — parking lots, roads and rooftops — causes excess stormwater to course through stream channels. This water often erodes streambanks each time it rains. Such erosion washes away private backyards as well as public property. Traditional stream repair methods are costly and can destroy aquatic habitats along with the natural beauty of the stream. Culvert pipes and concrete-lined channels can accelerate flow, often contributing to erosion and flooding problems downstream.

Bioengineering offers less expensive and more environmentally sound options to repair streambanks. This pairing of engineering principles and biological expertise can reduce erosion while maintaining a more natural stream. Native plants intermingled with man-made structures have been demonstrated to withstand flooding and other severe conditions. And the native vegetation creates habitat along the stream.

North Carolina Sea Grant is sponsoring a workshop in Raleigh Oct. 31 and Nov. 1 that will offer hands-on training using several bioengineering techniques, including A-Jacks, lunkers and willow posts.

Bioengineering has become a well-known concept to most resource

managers. Yet still largely unknown is where, when and how to apply the technology. "Innovative Stream Repair" will present the latest procedures and techniques for stabilizing streambanks in rural residential and urban areas using bioengineering. It will include a field tour of a variety of degraded stream conditions where bioengineering solutions can and cannot be used.

The demonstration site is an inprogress repair of Rocky Branch Creek at N.C. State University. The techniques being used there include concrete A-Jacks, natural and synthetic fabrics, and vegetation.

A strong assembly of bioengineering practitioners and researchers from the upper Midwest will lead the workshop. Through grant funding from the U.S. Environmental Protection Agency, Donald Roseboom has developed innovative stream repair techniques that are environmentally friendlier and less expensive than traditional methods. Randy Stowe is a bioengineering consultant and contractor who has designed and implemented a range of streambank stabilization and stream corridor management projects. Joe Chaplin is the stream maintenance coordinator for DuPage County.

Working with Stowe and Roseboom, Chaplin revitalized a 1-mile segment of stream for only \$150,000. The workshop also features North Carolina engineers, biologists, natural resource managers and a municipal landscape architect who will provide relevant information about stream degradation, stream ecology, urban situations, environmental regulations and stormwater.

Registration is \$140 and enrollment is limited. Some professional education credits will be awarded to participants. For more information, call Barbara Doll, water quality specialist, N.C. Sea Grant, at 919/515-5287.

Below are the results of our Coastwatch reader survey. We mailed surveys to 490 subscribers — every fifth person on our zip-sorted mailing list. We received 264 completed surveys back in our office, which constitutes an excellent response rate of slightly more than 50 percent. Thanks to all of you who took the time to complete the survey and send it back. Your comments and suggestions will be helpful as we plan for next year.

Here's what you had to say. Reader comments are preceded by this symbol: ▲, and editor's comments appear in italic.

How many people read your Coastwatch?

One (15%)

Two (47%)

Three (14%)

Four (7%)

Five or more (16%)

Based on this information, we know that 2.6 people read each copy of Coastwatch mailed for a readership of about 6,800.

How long have you subscribed to Coastwatch?

> Three or more years (69%) One to three years (23%)

Less than one year (8%)

How often do you read the following sections of Coastwatch?

Always	Usually	Sometimes	Never		
Longer	feature sto	ories			
(54%)	(34%)	(9%)	(0%)		
Short science stories					
(60%)	(30%)	(8%)	(0%)		
Short nature stories					
(60%)	(30%)	(8%)	(0%)		
Stories about Marine Advisory					
Service activities					
(50%)	(29%)	(15%)	(2%)		
Aft Deck					
(50%)	(31%)	(10%)	(3%)		

What type of stories do you find most interesting or useful? (Check all that apply.)

> Stories about coastal history (82%) Stories about coastal resources

(75%)

Stories about coastal controversies (74%)

Stories about specific places (72%) Science stories (58%) People profiles (38%)

Which of the following best describe Coastwatch's presentation of information?

Fair and accurate (48%)

Easy to read (46%)

Outstanding (41%)

Informative (38%)

Biased (1%)

Too technical (1%)

Too environmental (1%)

Too sentimental (1%)

Too simple(1%)

Are the length of the Coastwatch feature articles:

About right? (93%)

Too short? (3%)

Too long? (3%)

Which of the following best describes Coastwatch's visual presentation? (Check all that apply.)

Attractive (84%)

Typeface easy to read (26%)

Not enough photographs (15%)

Not enough color (8%)

Typeface hard to read (1%)

Too flashy (0%)

Too much copy (0%)

Too conservative (1%)

Too many photographs (1%)

How useful to you is Coastwatch?

Moderately useful (47%)

Very useful (41%)

Marginally useful (7%)

Not useful (0%)

▲ I enjoy reading it for myself, and I use in my classroom.

- ▲ As a commercial fisherman, I need to keep up with all the hoopla and controversy.
 - ▲ Have ordered several publications

How did you find out about Coastwatch? A friend (25%)

Other Sea Grant newsletter (21%)

Other (21%)

One of the N.C. Aquariums (18%)

At a Sea Grant extension office (5%)

Newspaper (4%)

Library (3%)

▲ I have subscribed so long I don't remember.

As a result of reading Coastwatch, have you: (Check all that apply.)

· Increased your awareness of marine/coastal issues? (91%)

· Gained a greater awareness of Sea Grant efforts on behalf of the marine and coastal environment? (81%)

• Developed a better understanding or appreciation of marine science? (75%)

· Become a better-informed voter on coastal issues? (55%)

· Ordered any Sea Grant publications? (47%)

· Subscribed to any of Sea Grant's other free newsletters? (31%)

• Used the information as supporting material in a classroom or other educational situation? (20%)

 Attended Big Sweep, the statewide waterway litter cleanup? (15%)

• Used the information to help your community or state better manage or use its coastal resources? (14%)

 Called a Sea Grant agent or specialist? (10%)

• Used the information in your business to help develop solutions or answers to marine-related problems? (8%)

· Attended a Sea Grant workshop or conference? (7%)

Rate the importance of the following uses of Coastwatch to you:

Very Fairly Not Important Important Important

Raises awareness of marine/ coastal issues

(67%) (23%)

(6%)(0%)Educates about marine/coastal issues

(1%)

(61%) (30%) (3%) Is a source of regional coastal

information (49%)(35%)(7%)(1%)

Makes science understandable

(35%)(20%)

Presents the latest coastal research

(39%)(39%) (12%) Presents the latest coastal extension

activities (27%)(32%) (22%)

Is a source of marine publications (25%) (31%)(18%)

What do you like most/least about *Coastwatch*?

- ▲ Like the people/history stories.
- ▲ Like its perceived purpose: to inform.
- ▲ Very good and informative publication.
- ▲ It is dedicated to North Carolina coast and I like this because it presents regional information to me.
 - ▲ Easy to read, interesting.
- ▲ Clear, concise, timely. The best little publication I get! Keep up the good work!
 - ▲ I wish it had more pages to it.
- ▲ The magazine is unbelievably attractive, comprehensive, understandable and useful. I have never known an "official" publication that even approaches this one.
- ▲ The information contained in the bulletin gives me a much better understanding of the problems of our coast.
 - ▲ More color
 - ▲ Shorter stories
 - ▲ Don't change a thing.
- ▲ I like no advertisements and the reasonable cost.
- \blacktriangle I preferred the old format (the newsletter).
- ▲ Don't like black-and-white photos We would like to use four-color photographs throughout the magazine too, but that is unaffordable unless we build a much larger subscriber base.
- ▲ I have been disappointed by the placement of address stickers on beautiful covers. Also disappointed that I could not buy copies of some of your covers suitable for framing.

We are considering running a limited quantity of each cover, without type, as a print to sell. We are talking to our photographers, Scott Taylor and Michael Halminski, and our printer about costs.

Is there something you would like to see included in *Coastwatch* that is not there now?

- ▲ Perhaps a series on shells what you find and how to identify them
- ▲ Take a stand for positive measures to protect our marine natural resources first, then let however that set of actions affects the users of these resources be secondary.

▲ More historical articles on past coastal industries and ways of life. Add a readers' comment section.

We had a readers' comment and question section, but very few people wrote to provide comments or questions. If readers have question and comments, please write us. We would be happy to have a readers' page.

- ▲ Pertinent issues that North Carolina legislators and Congressmen are dealing with so we can write them about our opinions on the subject while options are still being considered.
- ▲ I like Sea Grant publication, workshop and conference information.
 - ▲ Seafood recipes
 - ▲ Beautiful cover photography
 - ▲ More people profiles
 - ▲ More about aquaculture
 - ▲ More maps
- ▲ Doesn't get published often enough.
 - ▲ More for young readers

Please suggest story ideas for *Coastwatch* articles.

- ▲ Keep up the great work. It is a magazine with wonderful discourse and diversity.
- ▲ I do not mean to suggest scare tactics, but I believe there is ample, available and generally understandable evidence to make it clear to reasonable people that we are "fouling our nest" and destroying crucial resources. Please focus on it to the extent you feel appropriate and soon.
 - ▲ Pirates
 - ▲ Sharks and rip tides
 - ▲ Ferries
- ▲ More sea-life stories, more wildlife stories, more on the history of the Outer Banks.
- ▲ Topsail Island. We really respect this magazine, and as long as it is printed, we will subscribe to it.
 - ▲ Golf course runoff
- ▲ Life cycles of coastal bird and animal life
- ▲ Stories on historical traffic on rivers leading to coast
- ▲ Cooperative efforts among business/industry, governmental agencies, and scientific/educational community to answer/resolve environmental issues and

challenges. I believe such success stories would serve to break down barriers and promote communication among these groups.

- ▲ History of Shackleford Banks
- ▲ I use the publication to stay informed about legal issues regarding submerged lands, riparian rights and wetlands issues. These areas are important to my business as a real estate appraiser.
 - ▲ Food safety
- ▲ Straight facts about fish populations and impact of net and sportfishing.
 - ▲ Navigation
 - ▲ Make reprints of articles available
 - ▲ Loons
- ▲ Occasional articles geared toward making new coastal residents better coastal citizens, e.g. building techniques, waste and sewage disposal, preservation of environment
 - ▲ Inlets
 - ▲ More real science, less storytelling

Age of subscribers:

18 and under (0%)

19 — 29 (1%)

30 — 49 (34%)

50 — 65 (34%)

Over 65 (28%)

Sex of readers:

Male (64%)

Female (25%)

Education: (Check highest grade completed.)

Grade school (0%)

High school (12%)

College (51%)

Master's (21%)

Doctorate (12%)

Area of residence:

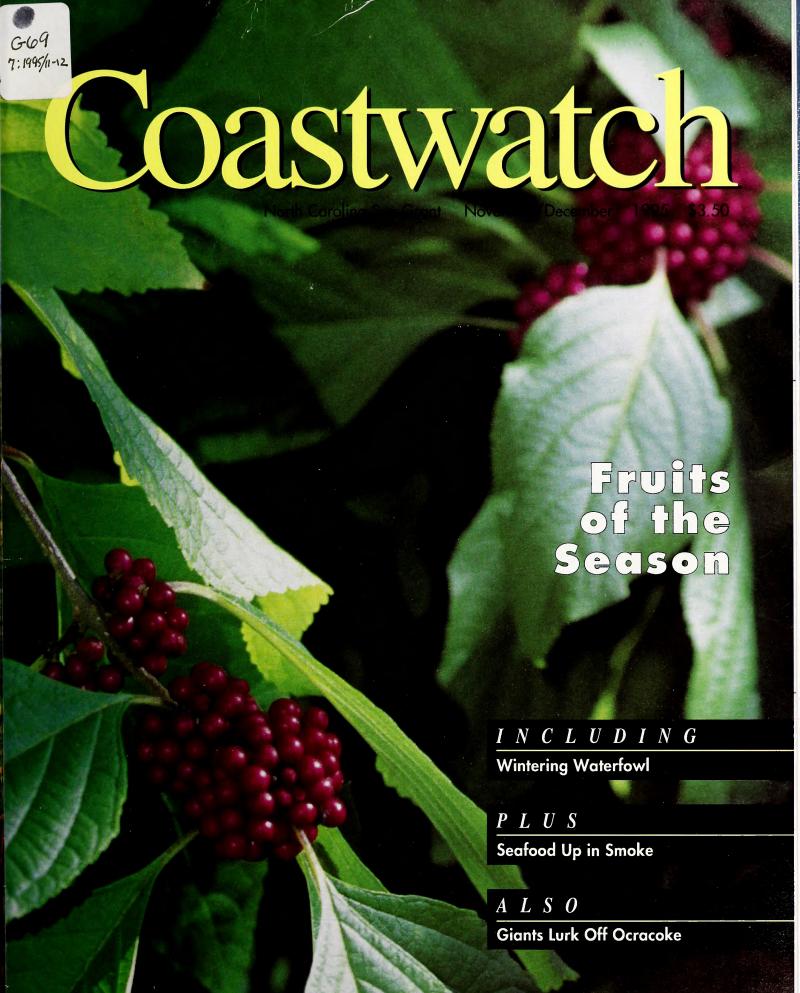
Coastal (42%)

Piedmont (22%)

Mountains (1%)

Out-of-state (24%)





Coastwatch Staff:

Kathy Hart, Managing Editor Jeannie Faris and Carla Burgess, Senior Editors Rachel Wharton, Staff Writer L. Noble, Designer Sandra Harris, Circulation Manager

The North Carolina Sea Grant College Program is a federal/state program that promotes the wise use of our coastal and marine resources through research, extension and education. It joined the National Sea Grant College Network in 1970 as an institutional program. Six years later, it was designated a Sea Grant College. Today, N.C. Sea Grant supports several research projects, a 12-member extension program and a communications staff. B.J. Copeland is director. The program is funded by the U.S. Department of Commerce's National Oceanic and Atmospheric Administration and the state through the University of North Carolina.

Coastwatch (ISSN 1068-784X) is published bimonthly, six times a year, for \$15 by the North Carolina Sea Grant College Program, Box 8605, N.C. State University, Raleigh, NC 27695-8605. Telephone: 919/515-2454. Fax: 919/515-7095. E-mail: k_hart@ncsu.edu. World Wide Web address: http://www2.ncsu.edu/ncsu/CIL/sea_grant/index.html Second-Class Postage paid at Raleigh, N.C.

POSTMASTER: Send address changes to *Coastwatch*, N.C. Sea Grant, Box 8605, N.C. State University, Raleigh, NC 27695-8605.

Front cover photo of beautyberries by Scott D. Taylor.

Inside front cover photo of Masonboro dune by Eddie Nickens.

Printed on recycled paper by Highland Press Inc. in Fayetteville, N.C.





Give them
Coastwatch!
It's a present
that will
delight and
entertain
all year.

They'll
explore
each new
issue,
soaking
up the
adventure
and wonder
of coastal
North
Carolina.
And they'll
love you
for it!

See the attached gift cards for more information.

a remember of change of data ess, p	please attach recent magazine label. Incli	ude new address.)
Name:		
Address:		
City:	State:	Zip:
Coastwatch, Box 8605, N.C. S	e. Please send check or money order to State University, Raleigh, NC 27695-8 e allow 6-8 weeks for delivery on new such	3605
Gift Subscription	on	
☐ 3 years/\$42 ☐ 2 years/\$2		20.)
For: Name:		
Address:		
City:	State :	Zip:
	e. Please send check or money order t	
Coastwatch, Box 8605, N.C. S	State University, Raleigh, NC 27695-8 e allow 6-8 weeks for delivery on new su	
Coastwatch, Box 8605, N.C. S	State University, Raleigh, NC 27695-8	
Coastwatch, Box 8605, N.C. S (All orders must be prepaid. Please	State University, Raleigh, NC 27695-8 e allow 6-8 weeks for delivery on new su	
Coastwatch, Box 8605, N.C. S (All orders must be prepaid. Please) Gift Subscription 3 years/\$42 2 years/\$2	State University, Raleigh, NC 27695-8 e allow 6-8 weeks for delivery on new su	bscriptions.)
Coastwatch, Box 8605, N.C. S (All orders must be prepaid. Please) Gift Subscription 3 years/\$42 2 years/\$2 (A gift card will be sent to the recip	State University, Raleigh, NC 27695-8 e allow 6-8 weeks for delivery on new sur on 1 year/\$15	bscriptions.)
(All orders must be prepaid. Please Gift Subscription 3 years/\$42	State University, Raleigh, NC 27695-8 e allow 6-8 weeks for delivery on new sur one of the state of the sta	bscriptions.)

(All orders must be prepaid. Please allow 6-8 weeks for delivery on new subscriptions.)

Give them
Coastwatch!
It's a present
that will
delight and
entertain
all year.

They'll
explore
each new
issue,
soaking
up the
adventure
and wonder
of coastal
North
Carolina.
And they'll
love you
for it!

See the attached gift cards for more information.

Table of contents

N.C. STATE LIBRARY RALEIGH

Features

Due South

Holy Smoke - It's Seafood

There's nothing that can titillate your tastebuds like smoked fish. Eaten plain on a cracker or added to pasta, smoked fish offers intense flavor that has cash registers ringing at smoked fish companies, gourmet food shops and supermarkets. Indeed, consumers have learned that smoking fish isn't just a way of preserving the catch. *Coastwatch* writer Kathy Hart will introduce readers to smoked fish and a Tar Heel company cashing in on the smoked fish craze. . . . 10

The Roast: A Writer's Yearly Sojourn Hydrates His Soul

Free-lance writer Eddie Nickens takes readers on his yearly pilgrimage to Masonboro Island. His fall sojourn to this isolated barrier island with a few longtime friends helps him cleanse his soul, revive relationships and re-establish life-sustaining links to nature.

Hungry Giant Tuna Put Outer Banks in the Spotlight

A Berry Good Meal for Birds

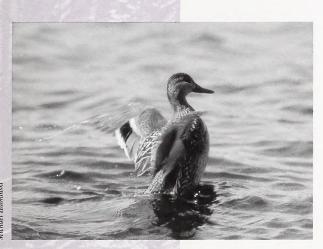
In the fall and winter, migrating and wintering birds are always searching for their next meal. A variety of coastal vines, trees and shrubs offers a bounty of berries that can slake their hunger.

Coastwatch writer Kathy Hart provides a colorful description of these native coastal plants and their cultivated cousins, which can be placed in your landscape to add beauty and food for our feathered friends.

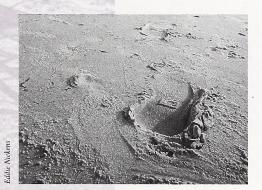
20

Departments

Network News.	. 22
Book Review	24
Aft Deck	25



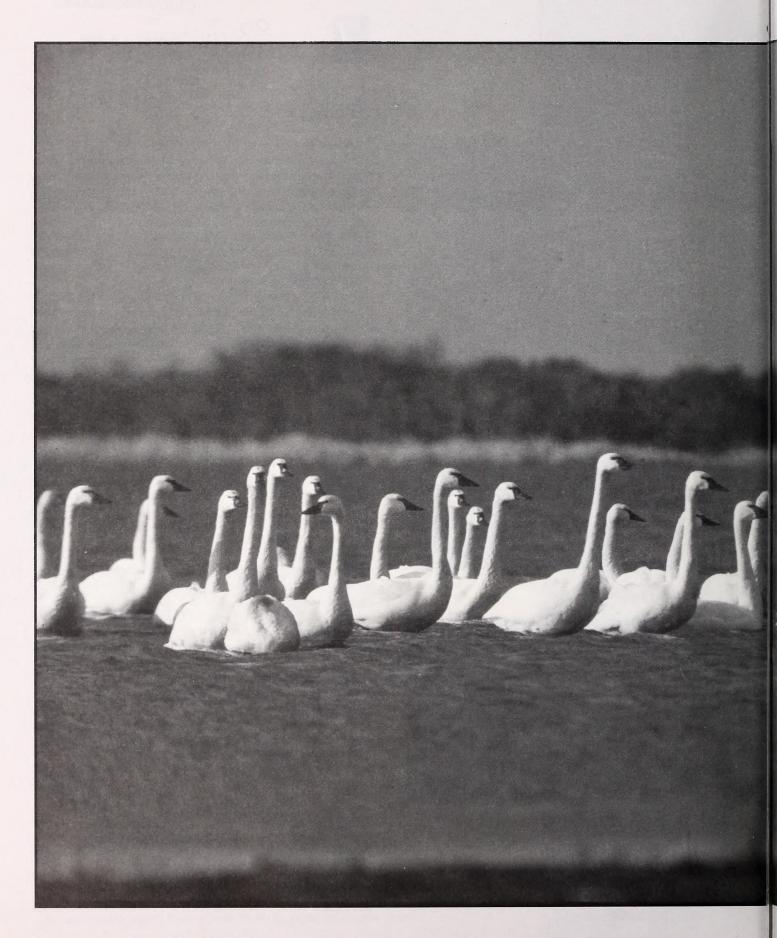
Page 2



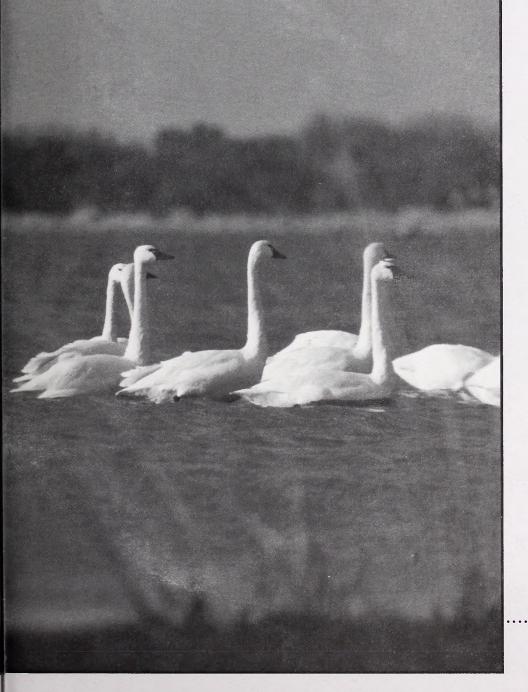
Page 14



Page 20



Due South



Wintering
Waterfowl Make
North Carolina
A Stop On Their
Flight Plan

By Rachel Wharton

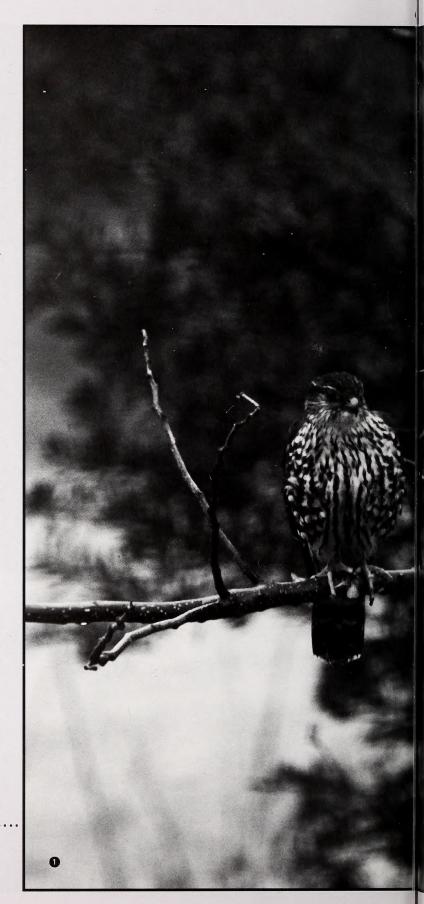
Photographs by Michael Halminski

With brilliant white bodies,
long slender necks and black beaks,
this flock of tundra swans enjoys the
solitude of the Pea Island National Wildlife
Refuge. The tundra swan makes its annual
trek to Pea Island from the frozen grounds
of Alaska, Canada and the Arctic.

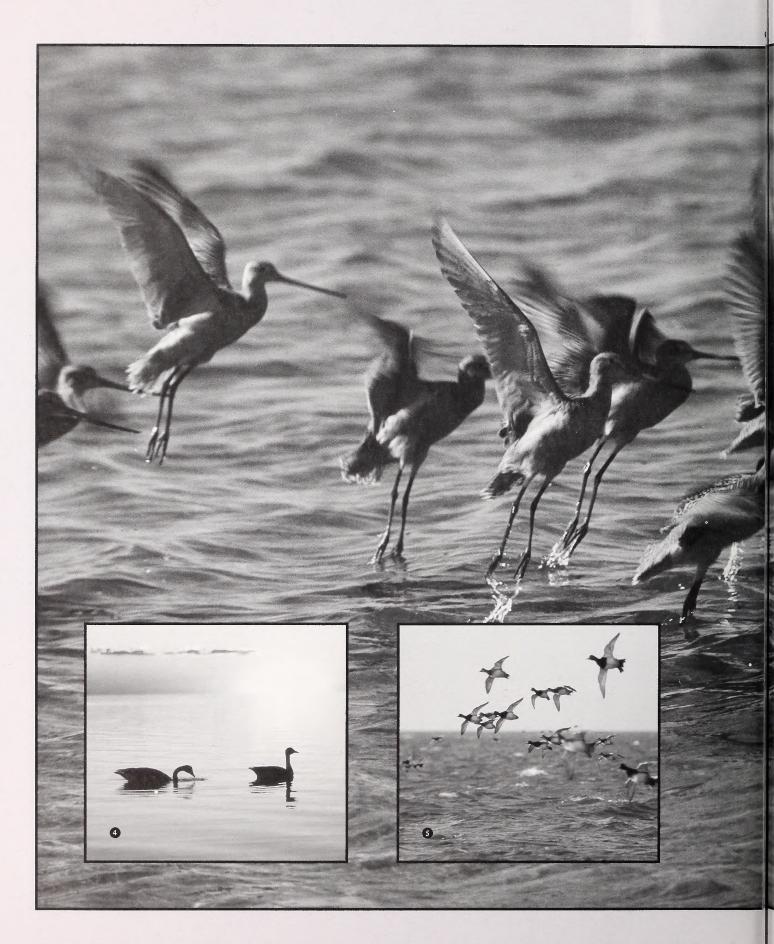
It may not be peak tourist season, but the Outer Banks are humming with activity. In fact, visitors are flying in from miles away. The Pea Island National Wildlife Refuge, which covers Hatteras Island south of Oregon Inlet to the town of Rodanthe, is an autumn rest stop and winter home to millions of birds — particularly ducks, swans and geese.

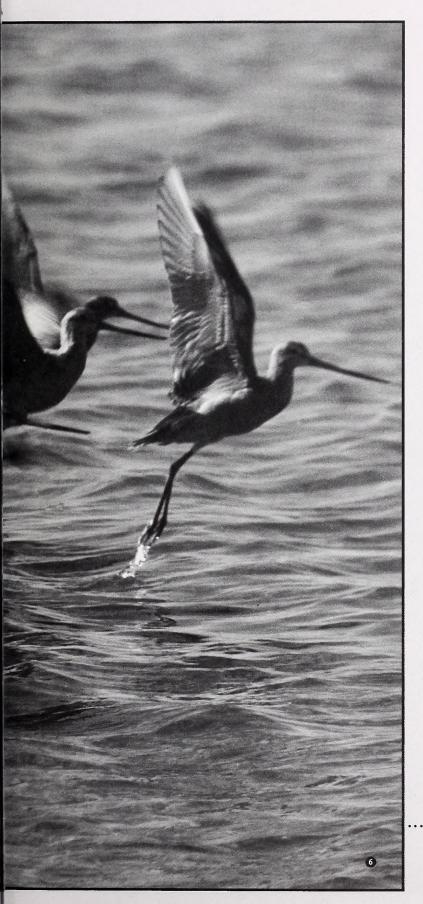
Continued

- 1. On a branch above the marsh, a sharp-shinned hawk awaits its prey. During the past 50 years, tall woody shrubs have become more abundant on the refuge. As a consequence, hawks, eagles and falcons, which prefer these perches, have taken up residence. Upland plant populations of gallberry, wax myrtle and baccharus invade as wetland soils dry out. This loss of wetland habitat has resulted in a reduction of snow geese, swans and other waterfowl. That's why the Pea Island National Wildlife Refuge takes special precautions to maintain wetland areas.
- 2. Although these young hooded mergansers sport their dark winter clothing, their crests make them easy to distinguish. A subfamily of the duck order, mergansers feed by diving for fish. In the spring and summer, watch for the vivid crest of the adult male. It's bright white with a black border.
 - Snow geese fill the sky, their snowy-white bodies accented with black wing tips, pink feet and pink bills.
 Goslings have dingier bodies, darker feet and dusky bills.









In 1938, the Pea Island National Wildlife Refuge was established by President Franklin D. Roosevelt to provide habitat for wintering waterfowl. In the early '30s, the Civilian Conservation Corps (CCC), the Army Corps of Engineers and the Department of the Interior built a series of high dunes that stabilized the barrier islands.

Behind those dunes on Pea Island, the CCC developed a 5,915-acre waterfowl oasis. Managed by the U.S.

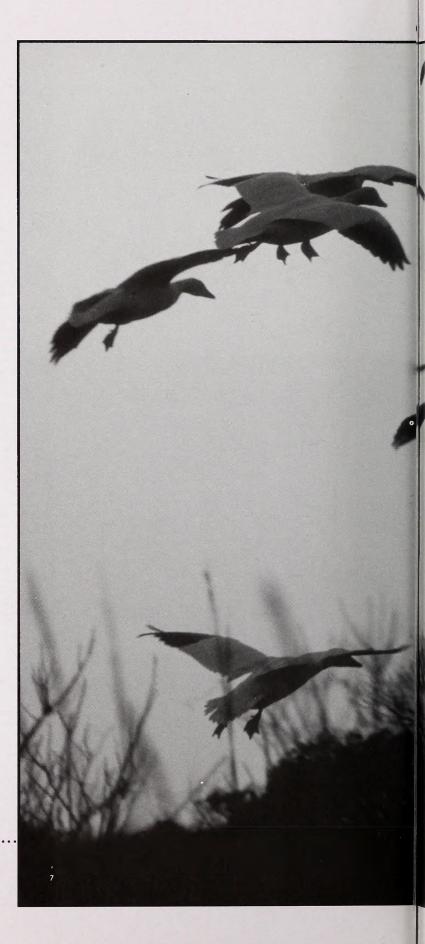
Continued

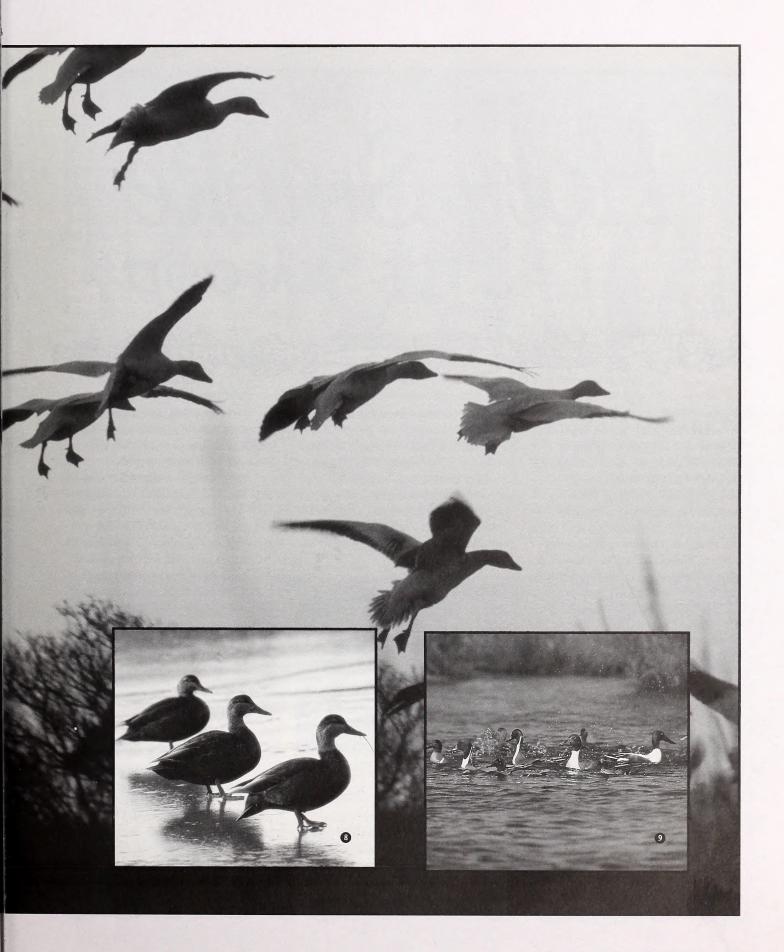
- 4. Canada geese search for roots, seeds and tubers of aquatic plants in the glow of a marsh sunset. They can also be identified by their black heads and necks and white chin straps.

 Often feeding on rice, corn and other crops, Canada geese are not always popular among farmers. These birds are known for their flying V formation. Canada geese are sometimes called honkers for their nasal-sounding calls.
- 5. Redhead ducks are often attracted to decoys placed on the Pamlico Sound. Redheads can be identified by their cinnamon-red heads and their calls, which resemble a cat's meow. Rather than dabbling at their food as puddle ducks do, diving ducks feed by diving headfirst into the water and gathering up aquatic vegetation, insects and tiny crustaceans from the bottom. Redheads that winter along the Outer Banks migrate east from their prairie pothole nesting grounds. They travel in flocks of hundreds or even thousands, forming rafts of ducks on the water.
 - 6. The beaches and ponds of the refuge are dotted with shorebirds lurching on their stiff, long legs. At North Pond, marbled godwits take off in a breathtaking display of wings and legs. You'll know the godwit by its call, which sounds just like its name.

Fish and Wildlife Service, the refuge boasts ocean beaches, barrier dunes, salt marshes, creeks and bays; 25,700 acres of the Pamlico Sound; and three constructed freshwater and brackish water ponds. Amongst the marsh grasses, wax myrtles, live oaks, salt flats, coastal waters and dunes, more than 300 species of birds rest, nest or feed. And more than 1.2 million people visit each year to watch them.

- 7. Snow geese coast against a winter sunset at Pea Island.
 Although both varieties of snow geese (greater and lesser)
 are found at the refuge, all greater North American snow geese
 follow a strict migratory route straight down the eastern
 corridor of the United States. The largest number of them
 winter in the Pea Island area.
- 8. On a frozen tidal creek, these black ducks might not have any luck in their search for submerged plants, snails, crustaceans or insect larvae. Black ducks aren't black they're really a deep chocolate-brown.
- 9. Puddle ducks are some of the most prominent members within the Pea Island National Wildlife Refuge community.
 Two of the most common duck species in North America the pintail and the mallard are puddle ducks.
 Puddle ducks feed by dipping in the water, nipping and tugging at the seeds, roots and stems of underwater plants.
 Here, pintails, green-winged teals, a shoveler and a mallard splash in the shallow waters of North Pond.
 Of the three brackish and freshwater impoundments of the refuge (South Pond, North Pond and Newfield), only North Pond is accessible to the public through a walking trail and a mowed path that sweeps around the pond.





HOW SMOKE ...IT'S SEAFOOD



By Kathy Hart

Large amounts of tuna, salmon, bluefish and scallops are going up in smoke. Nationwide, Americans have developed a taste for the woodsy flavor of smoked seafood. Once considered a high-priced specialty item or ethnic food, smoked seafood is becoming as common at the grocery store as fresh Parmesan cheese and as affordable as other value-added meat products such as stuffed pork chops and marinated chicken breasts.

Smoked seafood has a strong, rich flavor, so a little goes a long way, says Joyce Taylor, Sea Grant's seafood education agent. It can be eaten plain as an entrée, added to a cracker as an hors d'oeuvre, paired with a bagel and cream cheese or added to pasta, chowders, sauces, salads or pizza.

"Add it to a dish where you want a flavor punch," Taylor says.

Think of bite-size pieces of smoked salmon in a cream sauce over pasta, a hearty winter chowder with hunks of smoked grouper or a gourmet pizza topped with smoked bluefish.

The possibilities are endless for the cook willing to experiment. Simply substitute smoked seafood in place of its fresh counterpart or instead of a flavor enhancer such as bacon, Taylor says.

Smoked foods need no additional cooking. When adding smoked seafood to other dishes, do so just before serving. Long heating periods will cause the smoked product to dry and lose its richness, Taylor says.

Where do you find smoked seafood?



It's increasingly available at supermarkets and specialty food stores, through mail order and right off the racks of home smokers and grills. Although smoked salmon is the most popular and prevalent smoked seafood, a variety of other species — bluefish, tuna, grouper, mackerel, mullet, drum, scallops, oysters and shrimp — are being offered by retailers.

More smoking companies are setting up shop nationwide, offering consumers a variety of high-quality products at affordable prices.

Bill Limieux operates Carolina City Smoked Seafood in Morehead City. Limieux smokes "anything caught in local waters" as well as a few nonlocal species, namely farm-raised Atlantic salmon. He sells his smoked delicacies over-the-counter at his retail outlet, by mail order to people around the world, and to local caterers and restaurants.

In addition to his smoked fish and shellfish, he sells a much-requested jerky made from tuna and a few value-added products such as smoked grouper spread and a smoked salmon cheeseball rolled in black pepper.

Most of the fish is smoked as fillets, Limieux says, because this form offers more surface area to absorb the flavors of the brine and smoke. Fattier fish such as bluefish and mackerel are the best candidates for smoking. Their higher fat content helps maintain moisture and flavor during smoking. But leaner, milder species can be smoked too. They just require closer monitoring.

All seafood is brined in either a

wet or dry brine before smoking. The basic brine is a salt and sugar mixture. If it's wet, water is added.

Limieux also adds mixtures of herbs, spices and other seasonings to the brine to create distinctive smoked products. The list of additives includes: maple syrup, lemon or orange zest, minced fresh ginger, herbs (thyme, dill, rosemary, sage), minced garlic, black or red pepper, or spices such as star anise or aniseed.

After absorbing the flavors of the brine for several hours, the seafood is ready for smoking. Limieux uses hickory wood chips to create his smoke, but other hardwoods such as maple, apple, cherry, birch, oak and ash also produce flavorful smoke. Even peach wood and grapevines can be burned. But commercial smokers and home cooks avoid using pine or other woods that contain large amounts of pitch.

The majority of Limieux's seafood is hot-smoked, meaning the product is cooked and smoked. Cold-smoked seafood is smoked but not cooked (see sidebar below). Gravlax, a Scandinavian specialty, is the only cold-smoked product Limieux produces.

Smoked seafood is not cheap—but neither is fresh seafood. Limieux's prices range from \$3.50 a pound for smoked mullet to \$30 per pound for smoked shrimp. Smoked bluefish is \$8.50 per pound; king mackerel, \$13.



Prices and products vary, Limieux says, according to what species are available and how much they cost at the docks. But he recommends that customers buy smaller quantities of smoked fish per person than fresh fish.

Taylor recommends 8 ounces of fresh fish per person. Limieux say 6 ounces of smoked fish will do. The richer, fuller flavor of the smoked product is more filling than its fresh counterpart.

If you develop a smoked fish habit, then you may want to learn to smoke your own. You can smoke seafood with a home smoker or grill. It's easier and faster than smoking red meat and most poultry.

The goal for smoking any meat is to cook it as slowly as possible at a low temperature. When hot-smoking fish, you want to keep the temperature between 175 F and 225 F. Lower temperatures mean longer smoking times, more intense flavor and less moisture loss.

If you plan to make smoked seafood a mainstay in your mealtime repertoire, then invest in a home smoker. They come in a variety of styles and sizes, so choose one that fits your needs and budget.

Vertical smokers offer several advantages over gas grills or kettle grills. First, the seafood is placed on a rack that sits a foot or more (rather than just inches) above the heat. This allows for slow, indirect distribution of the heat and holds the key to a flavorful final product.

Continued

Hot or Cold?

Two distinct processes can be used to smoke fish. The difference is temperature.

Cold-smoked seafood — such as the familiar salmon lox — is smoked but not cooked. Hot-smoked seafood is cooked during the smoking process.

Cold smoking takes place at temperatures between 70 F to 90 F for six to 16 hours. The heat source is separated from the chamber holding the seafood, and the smoke is transferred from the heat to the seafood via a heat-resistant duct. The smoke cools as it passes through the duct, preventing the transfer of heat. The result is smoke that flavors the seafood but doesn't cook it.

Although this process produces moist, flavorful seafood, the final result is still raw.

Hot smoking occurs at temperatures between 175 F and 225 F

for up to 12 hours — hot enough and long enough to cook the seafood.

Does one taste better than the other?

It's a matter of preference. Both methods yield products that are flavorful and palate-pleasing. The difference comes in the texture. Hot-smoked seafood is more firm and dry, sometimes less rich than cold-smoked products.

-Kathy Hart



Smoked Seafood Safety

Although many people consider smoking a preservation method, that is not true of modern techniques. When Native Americans smoked fish centuries ago, the smoking process lasted for days and was accompanied by drying. Most of today's smoked seafood needs to be kept in your freezer or refrigerator just like any other perishable food, says Joyce Taylor, Sea Grant's seafood education agent.

Because smoked seafood is soaked in a brine prior to smoking, it will last longer in the refrigerator than fresh seafood. Depending on the amount of brine used, smoked fresh seafood can be stored for two to three weeks in the refrigerator. And freshly smoked seafood can be kept in the freezer up to six months.

But what about all those smoked salmon fillets in foil pouches or vacuum packages that are sold in boxes at room temperature?

These products are actually canned, says Sea Grant researcher David Green, a seafood technology specialist at the N.C. State University Seafood Lab. In this case, the can is a thin metallic pouch or vacuum pack, and the seafood is processed just like canned peaches or peas. Therefore, these products can be safely held at room temperature until they're opened. Then they must be refrigerated just like fresh smoked products.

-Kathy Hart



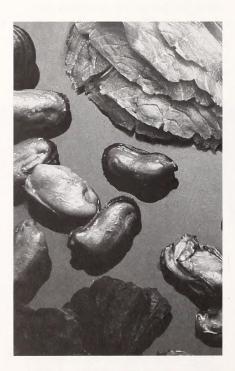
Also, most smokers include a pan for water, which creates a moist, smoky environment and a fish that melts on the tongue.

For more information about how to home-smoke seafood, send for Wisconsin Sea Grant's free brochure, "Home Smoking." Write Wisconsin Sea Grant, University of Wisconsin-Madison, 1800 University Avenue, Madison, WI 53705.

Smoked Fish Spread

- 1 pound smoked fish
- 1 pound cream cheese, softened
- 2 tablespoons fresh lemon juice
- 2 tablespoons chopped onion
- 1/4 cup chopped sweet pickles
- 1/2 cup finely chopped celery
- 4 tablespoons horseradish
- 1/2 teaspoon Tabasco sauce
- 1/4 cup chopped fresh parsley
- 3/4 cup light cream

Flake fish. Blend together cream cheese, lemon juice, onion, pickles,



celery, horseradish, Tabasco and parsley. Add fish. Blend in cream to reach desired consistency. Serve with crackers. Makes about 3 cups.

Joyce Taylor, N.C. Sea Grant

Stuffed Baked Potatoes

- 4 baking potatoes
- 1/2 pound smoked salmon or other smoked seafood
- 1/2 cup hot milk
- 1/4 cup chopped onion
- 1/4 cup chopped parsley
- 1 egg, beaten
- 1/4 teaspoon dill weed or thyme
- 1/4 teaspoon pepper
- 1/8 teaspoon salt (optional)
- 1/2 cup fine bread crumbs
- 1/4 cup butter, melted

Bake potatoes until done. Cut in half lengthwise while hot and carefully scoop potatoes out of the skins. Keep skins intact for stuffing. Mash potatoes, add hot milk and beat until fluffy. Flake fish and add to potatoes along with parsley and onion. Beat egg with dill weed, pepper and salt; fold into potatoes. Heap mixture into potato skins. Mix bread crumbs with melted butter and sprinkle over potatoes. Bake 20 minutes at 350 F or until browned. Serves 4 to 8.

Carolina City Smoked Seafood

Smoked Scallop Chowder

- 1/2 teaspoon salt
- 1 1/2 cups diced potatoes
- 2/3 cup diced carrots
- 2/3 cup sliced celery
- 1/2 cup chopped onion
- 2 cups water
- 2/3 cup milk
- 2/3 cup chicken broth
- 1/8 teaspoon white pepper
- 1 1/2 tablespoons butter
- 1/2 pound smoked scallops

In a medium pot, add potatoes, carrots, celery, onion and salt to water. Bring to a boil; lower heat and simmer until tender, approximately 10 minutes. Stir in milk, chicken broth, pepper and

butter. Purée in blender with 1/4 pound of smoked scallops. Return to heat. Coarsely chop remaining scallops. Add to chowder. Remove from the heat as soon as the chowder is thoroughly heated. Garnish with lemon wedges (optional). Serves 4.

Carolina City Smoked Seafood

Smoked Fish One-Dish Meal

- 1 pound smoked fish grouper, mackerel or mahi-mahi
- 1/2 cup chopped celery
- 1/2 cup chopped green pepper
- 1 cup sliced mushrooms
- 3 tablespoons olive oil
- 2 teaspoons all-purpose flour

- 4 ounces processed cheese spread
- 4 ounces shredded sharp cheddar cheese
- 1 10-ounce can tomatoes
- cooked rice or pasta

Cut smoked fish into small pieces, cover and set aside. Sauté celery, green pepper and mushrooms in olive oil in a large skillet until tender, 3 to 5 minutes. Stir in flour, cheeses and tomatoes. Cook over low heat until cheese melts and mixture thickens. Add smoked fish and stir gently until thoroughly heated. Serve over cooked rice or pasta. Serves 4.

Carolina City Smoked Seafood

Enjoy!

The Basics of Seafood Smoking

After several days of writing about smoked seafood, I had to try it myself. Using my home smoker, I smoked three types of seafood - a salmon fillet, a grouper fillet and tuna steaks. All were delicious, and the process was easy.

Here are the basics:

1. Buy the freshest fish possible. As Joyce Taylor always says, no amount of cooking or smoking is going to make a bad (spoiled) fish better. Oilier fish tend to hold the smoked flavor more easily, and thicker fillets or steaks are easier to handle.

2. Make a brine. I used this recipe:

- 1 cup kosher salt
- 1 cup brown sugar

2 cups hot water

· seasoning - thyme, pepper, dill, red pepper, citrus peel or any favorite herb or spice

Mix the brine and let it cool. I used dill in the salmon brine, lemon peel and black pepper in the grouper brine and garlic in the tuna brine. Pour the brine over the fish in a glass or plastic container. Do not use metal. Salt is corrosive and reacts with some metals. Brine for two to four hours in the refrigerator.

3. Remove fish from brine. Allow to dry in a pan or on a plate in the refrigerator for one to two hours.

4. About 30 minutes prior to putting seafood on the smoker, start the charcoal. Also place the wood chips in water. After the charcoal briquettes are hot and

glowing, spread them in the bottom of the smoker. Sprinkle wood chips over the charcoal. Fill the water pan with water and place above the fire. The simmering water makes for a moister smoked product.

5. Place the fish on the grill rack. Close the smoker. The heat should be sufficient to raise the internal temperature to 160 F for 30 minutes. My smoker has a temperature gauge that tells me when the temperature is in the ideal range for smoking. If it's too hot, the fish will cook quickly and fail to absorb the smoke flavor. I smoked my fish for 1 1/2 hours; the result was flavorful and moist. My family is already clamoring for more.

-Kathy Hart



The Roast

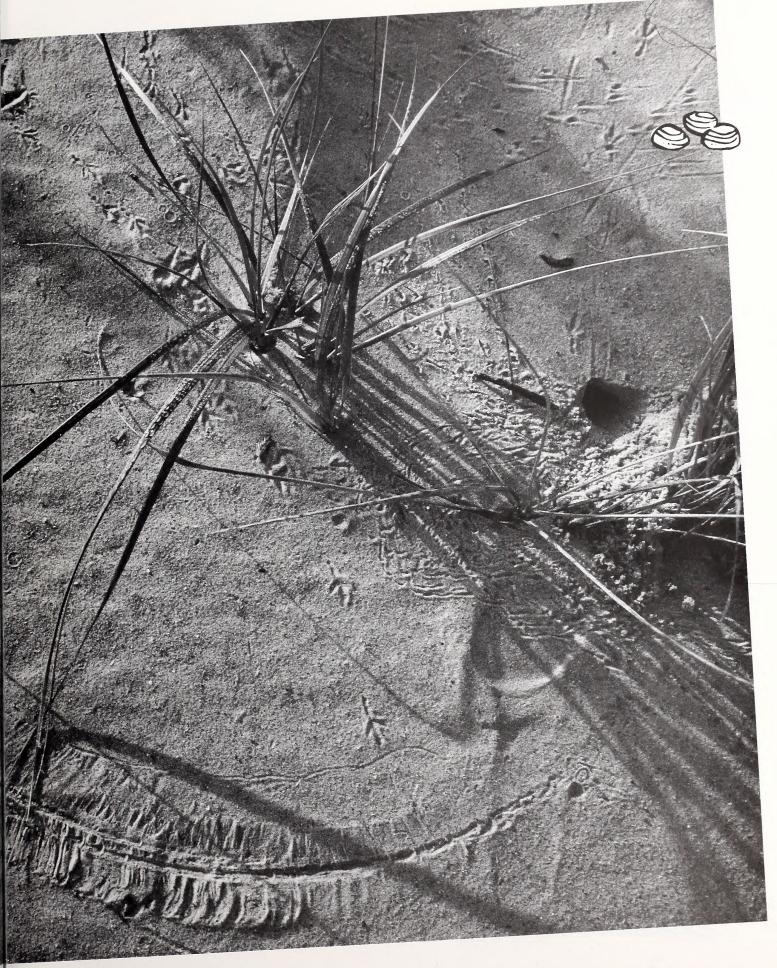
A Writer's Yearly Sojourn Hydrates His Soul

Story and photos by Eddie Nickens

It harbors an awesome emptiness, this island. From dune-fringed beach to marsh-edged sound, the hand of man is invisible.

There are no beach houses crowded against the primary duneline, no fishing piers or roads or neon, no *things to do*. At night the lights of nearby towns twinkle across the sound, and boats drone constantly in the distance. But turn to the open sea, and all but the island disappears, that and whatever baggage you couldn't leave behind.

Continued on page 16



A place like this is what you bring to it, and what it brings out in you.

For years we have trekked, my friends and I, to North Carolina's Masonboro Island for a few days each November, when winds and freezing nights have cleared the place of day-trippers and scoured the dunes of footprints. We meet on the docks of Wrightsville Beach to load down the boats with grills and lounge chairs and firewood and bushels of oysters, then ferry the lot, along with some two dozen castaways, to Masonboro, whose low sandy banks are just visible from the strip of Wrightsville's homes.

One friend just can't understand it. He is a fellow well-seasoned by such harsh environments as the cruel weather of early trout season, but he doesn't share our compulsions for camping on the coast. "You're gonna camp on the beach?" he asks, with all the vim and vigor of steamed toast. "Why don't you just wallow in Mazola and roll around in grits? It's all the same thing."

But it is quite a different thing. I speak of tents in the dunes, and he imagines sand in his sleeping bag. I tell of a seaside sunrise, and he asks what life is like as a human granola bar. Still, I can't fault my friend or his lack of enthusiasm. He has never been to the island, to the Roast.

We go for the oysters, the sea and the laughs, of course, but lately the Roast has become something more. It's become a spiritual touchstone for what we're trying to keep, on our way to what lies ahead. We have journeyed from a common past to a divergent present, we original Roasters: I am a writer, Bill is a hospital vice president, John an industrial-equipment sales rep, Gray a bank officer. Though our courses stray during the year, like migrant birds we are drawn back to these sand bluffs, to the source, each November. Shedding everything that makes us different — what we drive,

wear, make and spend — we return to those things that never change. It is our pilgrimage.

And as with most pilgrimages, getting there is an ordeal. Negotiating Banks Channel is easy enough, but then we have to cross Masonboro Inlet. Conflicting currents rip in and out of this small cleft in the narrow barrier islands of southern North Carolina. The waters here are further churned by the wake of powerboaters and fishermen; their swells rise like thunderheads, threatening to break over a boat's bow.



The beach here is a window between worlds, and I sit on the sill, watching them both awaken.

It's an easy crossing for John's 19-foot Mako; he's accustomed to running a johnboat all the way to the three-mile reef. It's more exciting for Bill and his Hobie Cat. But it's a downright adventure for me in my 16-foot canoe with a miniature outboard motor. I skim down Banks Channel, past homes and \$100,000 fishing boats, into the mouth of the inlet, nervously steering the bow through menacing humps of foamy sea. Passengers on 40-foot Bertrams look on in disbelief.

Not long ago the Roast was just a party. As many as 50 folks would show up, with maybe half that number

checking in for the overnighter. This year we're back to the basics. Keep it in the family, just the friends we've known long enough to know they'll always be around. I suppose this is what now gives the Roast its metaphysical meaning. So little in our lives seems immutable. Too often our alliances shift, eroding with the tides.

Just like this island. The storms of the past few months have winnowed the dunes, and our traditional campsite, the gap behind the primary dune at the island's head, is half its usual size. We are confused at first and wonder if we've motored or sailed or paddled too far. But no, we're together, on the island — where we should be.

So we set up the volleyball net and light the burger grills and the oyster cooker, a propane burner from an old tobacco-curing barn welded to a steel milk crate. Preferring my oysters fresh off the fire, I line up two pieces of wood to hold a row of shellfish above the coals. The juice spilling into the fire sends up wisps of aromatic smoke; I pull the oysters out with a gloved hand and dredge them through butter and red wine vinegar laced with Tabasco.

We eat for hours, blistering our fingers on the hot shells, laughing about the old times. We crowd around the fire like aborigines, telling tall tales and casting taller shadows on the sand. Sooner or later someone will call for a dune patrol, and the hardiest will strike off to explore the frigid dark island. Someone will stay up until the last embers die, but it won't be me. I help my wife up from the sand and we amble off into the dark to the sound of rails clacking in the black marsh, toward our tent by a break in the cordgrass.

At dawn I force myself out of the sleeping bag. Though there are no lullabies so restful as Poseidon's endless tides, there are also no sunrises more beautiful than those viewed with your toes on the edge of the continent, a path of shimmering sunlight reaching across the ocean and tapping at your

tent door. I trudge across the dunes to where sandpipers doze in a one-legged pose. The beach here is a window between worlds, and I sit on the sill, watching them both awaken.

Granted, there is sand in my ears and a chip of oyster shell in my eyebrow, but there is no visible damage from the previous evening's revelry. The sea is caim. Pelicans skim the surf, wingtip to wingtip, the low sun casting their shadows on the dunes, where the tracks of ghost crabs crisscross like tiny tractor treads. I follow a set of prints through the sea oats until they disappear into a crab hole, and wonder if its occupant is staring at me from the black void.

I trace my own tracks back through the dunes to the tent village, where a few people are stirring, water bottles in hand, wishing they'd remembered to bring Pop-Tarts or fruit bars for breakfast. The fire ring is a mere black smudge in the sand. Scattered about are drink cans, scorched marshmallow sticks and hundreds of oyster shells. There is work to be done.

The tents are soaked with ocean spray and need to be draped over the dunes to dry before stowing. We must pack up our things and police the dunes for shreds of paper and foil. Then we'll pile into the boats and leave behind only irritated crabs and footprints in the sand, soon to be covered by the same waters that have washed away the hard edges of our souls.

For these few days we have left behind the protective coloration we wear like tiger stripes in the world at large. Once ashore on the mainland, we will rub our bellies and moan, and for another year we will talk about the oysters, not letting on why we go to the trouble of the Roast at all — for the chance to crawl out of our pigeonholes, to remove all our labels and stand in the dark, thanking the twinkling stars above that some things — sea tides, the taste of oysters and these friendships — never change.



Hungry GANA GANA

Put Outer Banks in the Spotlight

By Carla Burgess

During the past two winters, giant bluefin tuna have become the surprise hit of the season for recreational anglers off Cape Hatteras and Ocracoke. Weighing more than 300 pounds, these monster-sized fish have appeared in increasing concentrations around wreck sites in recent years. The prime locations are 12 to 24 miles from the beach in 80 to 100 feet of water, just inshore of the Gulf Stream.

Although anglers may not target these tuna for harvest during winter, catch-and-release is increasingly popular.

"Charter boat fishing normally shuts down in October, and the captains go fishing commercially for yellowfin tuna or king mackerel in the winter," says N.C. Sea Grant fisheries agent Jim Bahen. But when news of the giants hit the grapevine, activity "snowballed."

"Hatteras Island started bustling with people driving in and flying in to go fishing for these big fish," he says. "This past summer the word really got out, and now charter boats are starting to advertise it. There's no time and no other place that you'll see this large concentration of animals in shallow

water. It's almost like they're in a pen."

The lure for recreational fishermen is even more attractive because this long-lived species is a strong, smart fish with notoriously picky eating habits. The hungry tuna off Hatteras are an enigma to seasoned anglers and biologists alike.

But as tall tales of big tuna spread far and wide, so has the controversy and confusion over regulation of this species. Since the early 1980s, resource managers have enacted progressively stricter management of all classes of bluefin on the heels of heavy harvest throughout the 1970s. Bluefin stocks have declined by 80 percent since then, according to National Marine Fisheries Service (NMFS) data.

The commercial season in North Carolina is short — about three months during summer — and the catch is limited to one fish per trip. But even with the restrictions, the effort is lucrative. Giant tuna are a minimum of 81 inches long, and some top 1,000 pounds. A giant bluefin may bring thousands of dollars on the Japanese fish market.

Sportfishermen must obtain special permits to pursue this category of tuna. And in exchange for the privilege of

targeting them, anglers must properly tag giant bluefins before releasing them. As tagged fish reappear, resource managers hope to learn more about the species' biology and migrations. And because of concern over mortality, the tagging may also reveal how the fish are faring after release.

These concerns and others are the basis of a December conference organized by N.C. Sea Grant. Bahen is arranging the meeting, slated for Dec. 16 in Nags Head, to answer questions about current management and to encourage proper tag-and-release techniques.

No one really knows why North Carolina has become host to a visible giant bluefin population that traditionally lured anglers to the Bahamas or New England and Canada. The anecdotal evidence is split about evenly on a theory. One is that these fish may have been here all along, says NMFS biologist Kevin Foster, who has interviewed Hatteras locals. Because most fishermen don't catch a quarter-ton to half-ton animal by accident, maybe the fish haven't been caught because they haven't been targeted. Several gillnetters have told stories of gaping holes knocked in their nets by unseen perpetrators. And many rod-and-reel anglers





Massachusetts fishermen haul in a giant bluefin exceeding 700 pounds.

have watched their tackle take off as if snagged by a torpedo. With a shrug, many have written off these skirmishes as shark strikes.

Alternately, a change in migration routes or feeding patterns is an equally probable explanation for the thick schools of giant bluefin at Cape Hatteras. "They may be feeding on bluefish that are wintering around wrecks in this area," says Bahen.

Whatever the reason, the presence of these fish is attracting a range of responses. Sport anglers are eager to tangle with the giants. Conservationists and commercial fishermen are worried about how the fish — valuable both ecologically and economically — will hold up in the race to fight and tag them. In the middle are the managers charged with allocating the resource and keeping it viable.

Bob Eakes of Buxton probably looked more giants in the eye than any other Tar Heel fisherman last winter. The owner of an Outer Banks tackle shop and an avid blue marlin angler, Eakes tagged 350 of the 450 large to giant bluefins he reeled in and released. But perhaps more importantly, he devised innovative techniques for hooking his catch in a way that may

increase their subsequent survival.

He used a full-circle hook that caught the fish in the lip 99 percent of the time. By contrast, fish that swallow the hook almost never survive. Eakes also used heavy tackle and reduced the fight time to a few minutes to minimize stress on the fish. This attitude represents a departure from a common tradition in big game fishing.

"There is very much a light tacklebig fish fishery for different species of fish," he says. "The International Game Fishing Association keeps records on who can catch the biggest fish on the lightest tackle. In pelagic species and especially tunas, I'm not real certain that's the right thing to be doing."

Fish become tired in prolonged fights, and the high levels of lactic acid produced — similar to adrenaline — can be fatal in some species.

"A lot of times, light tackle wears them out, and then when the fight is over, it really is over," says Bahen. "The concern of a lot of good anglers is that this is taking place off of Hatteras in the wintertime."

There's plenty of concern to go around on the topic. Rumors of released giants lying dead on the ocean floor have fueled the ire of many commercial fishermen. A bewildering set of regulations already exists with regard to bluefin fishing, and NMFS' Highly Migratory Species Management Division is planning to unveil a new set of proposed rules at a public hearing two days after the Sea Grant conference. Meanwhile, two dozen charter boat captains have petitioned NMFS to open the commercial season earlier than June. They'd like the agency to allow the harvest and sale of some of these serendipitous winter visitors.

As it stands, the only way a fisherman — commercial or recreational — can legally keep a bluefin in the off-season is as "incidental" catch while fishing for another species. Even then, an incidental landing is limited to one per year, a special permit is required and sale of the catch is illegal. Anglers specifically targeting bluefin to catch and release are required to carry a general permit and tagging kit.

Sea Grant's upcoming conference will explain the existing regulations and available scientific data and focus on responsible angling. Registration for the daylong meeting costs \$25. For information, call Bahen at 910/458-5498 or the main Sea Grant office at 919/515-2454.

By Kathy Hart

A variety of native coastal plants provides a bountiful meal of berries for migrating and overwintering birds in the fall and early winter. Many of the shrubs and plants grow wild, but cultured varieties can also be added to your landscape to attract our feathered friends.

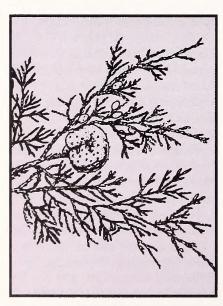
- The gray-white berries of the southern wax myrtle offer a feast for the white-eyed vireo, myrtle warbler, bobwhite, grackle, scrub jay, towhee and red-bellied woodpecker. This dense, native evergreen provides good nesting sites and wildlife cover too. The wax myrtle grows abundantly in the wild, but it can also be added to your yard as a border or screen.
- The hairy, red seed clusters of the flameleaf sumac are a winter favorite of the catbird and a so-so meal for the bluebird, mockingbird,

ABerry Good Meal For Birds

robin, starling, hermit thrush, wild turkey and red-headed woodpecker. In the fall, the sumac is spectacular with scarlet leaves and red berries. Although the sumac grows wild, its beauty and unique form should not be overlooked in landscaping, especially if it can be trained into a palm tree form.

• A host of birds — the cedar waxwing, cardinal, flicker, robin,

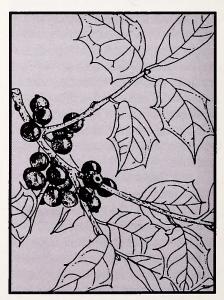
yellow-bellied sapsucker, hermit thrush, Bohemian waxwing and redbellied woodpecker — favors the familiar red berries of the native American holly. This Christmas favorite should be purchased from a nursery to ensure berry production. Wild hollies are difficult to move, and survival rates are low. In its natural habitat, the holly is an understory shrub in the forest.



Red Cedar



Red Bay



American Holly

When placing the American holly in your landscape, mimic nature by buffering the shrub behind buildings, walls or other shrubs and trees.

• Quail and bluebirds prefer the blue-black berries of the red bay. This large evergreen tree is closely related to the avocado and occurs naturally in maritime forests among canopies of yaupon, live oak, cedar and myrtle. Like other native coastal plants, the red bay has lots of potential as an ornamental in the home landscape.

• More than 68 birds are known to devour the blue-green berries of the female eastern red cedar. Among them are the purple finch, bluebird, evening and pine grosbeak, mocking-bird, myrtle warbler and Bohemian waxwing. Since the eastern red cedar is dioecious (there are male plants and female plants), only the female shrubs bear fruit. This native evergreen can grow 25 feet high or more.

But in areas where it is exposed to salt spray, it is usually reduced to shrub size. When used in landscaping, the red cedar should be planted on the lee side of the house or behind other protective vegetation.

• The shiny black berries of the Carolina laurelcherry are fall fare for the bluebird, mockingbird, robin, cedar waxwing and the ring-billed gull. This native evergreen tree is common in shrub and woodland zones along the coast. In the yard, the laurelcherry makes a decorative border along roads or property lines.

• The bright purple berry clusters of the American beautyberry are a meal for the cardinal, mockingbird, brown thrasher, wood thrush, bobwhite, catbird and robin. The show of beautiful fall berries makes this shrub an excellent choice for landscaping, especially when paired with evergreens. The berry-laden branches make an attractive display

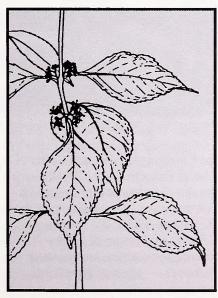
against the dark green foliage of evergreens.

• Two varieties of wild grape, the summer grape and muscadine, are vigorous, prolific vines along the coast and offer birds and small animals an ample supply of fruit. Both grapes can be planted to stabilize dunes, or they can be trained to cover a fence, trellis or arbor. If you can compete with the birds, the grapes from both can be made into jellies and wine.

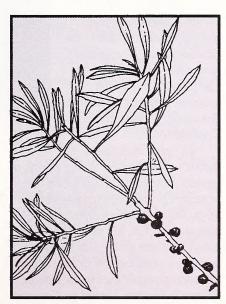
For more information about native plants and their conservation uses and benefits, send for a copy of "Seacoast Plants of the Carolinas" by Karl E. Graetz. This timeless Sea Grant classic is \$4.50 and provides more than 200 pages of valuable coastal landscaping advice. Send a check or money order to N.C. Sea Grant, Box 8605, N.C. State University, Raleigh, NC 27695-8605.



Carolina Laurelcherry



American Beautyberry



Wax Myrtle

North Carolina Sea Grant is part of a network of Sea Grant programs that rim our nation along the Great Lakes and ocean coastlines. There are 29 programs, reaching from Hawaii to Puerto Rico, from Alaska to Florida.

Each sponsors an innovative array of research projects, education and outreach activities.

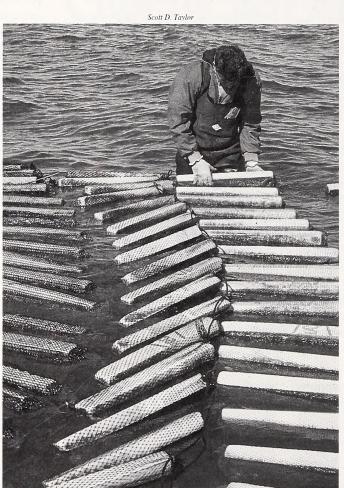
Beginning with this issue, Coastwatch will periodically update you on the research results, extension projects and publications produced by the Sea Grant network. We hope you'll develop a better understanding of Sea Grant and its nationwide efforts to promote the wise use and stewardship of our ocean and Great Lakes resources.

Battling Oyster Diseases

Two microscopic parasites, known as Dermo (*Perkinsus marinus*) and MSX (*Haplosporiduium nelsoni*), have taken their toll on oyster populations on the East Coast. The diseases have ravaged the famed Chesapeake Bay oyster grounds, and they've had devastating effects in North Carolina too.

To better understand the parasites and their killing effects on oysters, a battalion of Sea Grant researchers is studying the diseases, the environmental factors that favor the parasites' spread, the oyster's lack of natural defense and possible ways to control or eliminate the diseases. This research is part of the Oyster Disease Research Program funded by Congress as a special initiative of the National Sea Grant College Program five years ago.

One of the first steps in understanding Dermo came in the ability to culture the disease in the laboratory. Researchers from the Virginia Institute of Marine Science (VIMS), Rutgers University in New Jersey and



Growing oysters at the surface helps avoid diseases.

the University of Maryland Center of Marine Biotechnology (COMB) developed techniques for continuous culture that make it possible to study the parasite's life cycle and how different environmental factors — salinity, temperature, heavy metals, chemicals — affect its growth and behavior.

VIMS scientists are tracking the enzymes that Dermo releases when it

attacks an oyster cell. Called proteases, these enzymes break down oyster tissues and likely contribute to the oyster's death. The researchers found that Dermo can grow and divide in an oyster's hemocytes, cells in the

mollusk's circulatory system that fend off invading diseases and bacteria. Since the hemocytes don't ward off the Dermo, other factors may be important in resistance.

In particular, the Pacific oyster (*Crassostrea gigas*) has been found to be more resistant to Dermo than the Eastern oyster (*Crassostrea virginica*). This resistance may be linked to special inhibitors in the Pacific species. If identified, protease blockers could be developed that would behave like antibiotics in fighting the parasite.

At COMB, scientists are studying how the availability of iron affects Dermo's presence and growth. Recent studies indicate that Dermo has a strong need for soluble iron, and its growth rates are correlated with iron availability.

Environmental factors in Chesapeake Bay and North Carolina estuaries may increase the availability of iron. Low concentrations of

oxygen, called hypoxia, occur in both areas in the summer and trigger chemical reactions in the sediment that release iron into the water. This may explain why Dermo is more prevalent in summer months in oysters located in estuarine waters with low dissolved oxygen.

Scientists speculate that excessive iron accumulation in the oyster in summer promotes the proliferation of

Dermo, which may inhibit the oyster from producing the oxygen compounds it needs to defend itself.

Other environmental factors may also affect the oyster's susceptibility to Dermo. Maryland scientists learned in lab studies that tributyltin, a bottom paint for protecting boat hulls, increased the oyster's likelihood of infection. Comparable results were found at VIMS when scientists tested the effects of polyaromatic hydrocarbons, a byproduct of fossil-fuel combustion that accumulates in estuarine sediments.

Tackling the problem from a different angle, another group of scientists from VIMS, Rutgers and the University of Maryland is working with Maryland Sea Grant shellfish specialist Don Meritt to use genetic breeding techniques to rear strains of oysters resistant to Dermo and MSX. Already, scientists have reared MSX-resistant stocks. These stocks have also been subjected to 18 months of Dermo exposure. Now scientists are placing the specially bred oysters in floating trays in the Choptank River in Maryland and Mobjack Bay in Virginia. They will compare their growth and disease resistance with local oysters. Surviving oysters will be sent back to the lab for breeding.

Dermo struck Chesapeake Bay and North Carolina estuaries hard in the late 1980s. But it's been prevalent in the Gulf of Mexico since 1950. Because of the prolonged exposure to the parasite, Gulf stocks of the Eastern Oyster may have developed natural immunities that don't exist in mid-Atlantic stocks. By further testing the susceptibility of Gulf stocks and analyzing their DNA, scientists are hoping to locate a genetic marker to identify resistance.

• Adapted from an article written by Merrill Lefler for Marine Notes, a publication of the Maryland Sea Grant College Program.

Ocean-Fresh Flavor

What makes saltwater fish taste different from freshwater fish?

A University of Wisconsin Sea Grant researcher knows the answer. He is investigating what makes fish have an ocean-fresh flavor.

Food scientist Robert Lindsay says he hopes to improve the consumer appeal of fish by studying compounds responsible for the enjoyable, sealike flavor of ocean fish. He also wants to find ways to eliminate unpleasant flavors in fish.

Lindsay has learned that ocean fish have a distinctive taste due to a diet rich in bromophenols — chemical compounds occurring naturally throughout the marine environment in sea mosses, algae, sandworms and sea salt.

He can produce the same flavor in freshwater fish by adding tiny amounts of bromophenols to their diet. Bromophenol-fed fish have slightly whitened flesh and a mild, marinelike flavor, similar to crab or lobster. Panels of taste-tasters preferred the flavor of these fish over fish that were not fed the special diet.

Aquaculturists may be able to use Lindsay's research to improve the flavor of commercially grown fish and shellfish.

Consumers have complained that large, commercially grown shrimp and prawns are lacking in flavor. Lindsay says the shellfish are lacking because they're fed commercial feeds that don't contain the normal flavors available in the wild.

Lindsay is also trying to get rid of unwanted fish flavors. Because the most unpleasant fish flavors are caused by the oxidation of long-chain fatty acids in fish and fish oils, he's working with antioxidants.

Fish processors could add these antioxidants directly to fish fillets or fish oils to suppress unpleasant fish flavors or mix the antioxidants with fish spices during packaging and freezing.

• Adapted from an article written by Linda Hart for Littoral Drift, a newsletter published by the University of Wisconsin Sea Grant Institute.

Fisheries Management for Fishermen

Sea Grant has produced a muchneeded manual to help fishermen unlock the mysteries of fisheries management jargon. It will also help them decipher fisheries regulatory processes.

"Fisheries Management for Fishermen: A Manual for Helping Fishermen Understand the Federal Management Process" explains the dramatic increase in fishery regulations over the last five years. The manual describes new methods of measuring the health and abundance of fisheries and the framework in which fishery managers must operate. It is written by Richard Wallace and Stephen Szedlmayer of the Auburn University Marine Extension and Research Center, along with William Hosking of the Alabama Sea Grant Extension Service.

"The manual is helpful to all kinds of people," Hosking says. "It is even being used as a part of the text and outside reading material for fisheries management courses on the college level."

To receive the free manual, write the Mississippi-Alabama Sea Grant Consortium, P.O. Box 7000, Ocean Springs, MS 39566-7000. Include \$1.25 for shipping and handling within the United States, \$2 for outside the United States.

Ocracoke Wild

Sea Grant education specialist Lundie Spence reviews "Ocracoke Wild: A Naturalist's Year on an Outer Banks Island."

Pat Garber did what many of us wish we could have done or still want to do: take off some time to enjoy a simpler life, keep a journal and slow down. Garber visited Ocracoke and felt the need to stay for her own well-being. Five years later in 1991, she returned to live on this tiny Outer Banks barrier island. Ocracoke, the island, the village, and the people, must have left a strong impression on her.

"Ocracoke Wild: A Naturalist's Year on an Outer Banks Island" is a collection of columns published over the years in the coastal publication Island Breeze. But it reads like a journal of her experiences. Garber combines snippets of natural history, twining her observations with local lore, science and speculations. Open the book to any chapter — about seals, frogs, loons, mosquitoes or fiddler crabs — and you'll learn a little bit about each creature in its island context and how Garber got to know it. Her stories aren't the most scientifically accurate, but she opens a door for us to look into her personal experience. If we want to know more, there are field guides and more comprehensive books.

The chapter on brown pelicans is a good example of Garber's style. She tells a story of when she and a group of Ocracoke volunteers joined researchers from the Smithsonian Institution, N.C. State University and the Audubon Society to band pelicans on Beacon Island in Ocracoke Inlet. Wearing heavy clothing, the teams worked in the sizzling summer heat to capture "incredibly ugly baby pelican chicks" — so ugly they're cute. You ask, like Garber did, why the full cover on a searing July day? After her description



Gana Furr

of how one of the 400 chicks regurgitated its breakfast of fish on her shirt and another volunteer received the splat from an overhead laughing gull, the answer is perfectly clear.

Garber writes that her formal training is in environmental anthropology. She teases us with sparse introductions to the people of this island environment. Her interactions with local people, in her sailboat or kayak, reveal the charm of the village. I admired her investment of time and physical energy to learn the local trades: oystering, clamming, shrimping and floundering. I also admired her empathy with the wild creatures and the perils we humans have advanced. As a trained and certified wildlife rehabilitator, Garber has learned how to make a difference to many animals, including a young green heron probably wounded by a car. She shares stories about how other volunteers with proper certification have helped with dolphin strandings. Garber's animal stories don't always have happy endings. She makes the point that most injured wild animals can't be saved, but trained volunteers can make a difference.

If book reviews need to include the critical perspective, then I suggest that the science in this book could use some fine-tuning. For example, diatoms are not protozoans. They are microscopic,

single-celled plants called phytoplankton. And the calcareous part of Ocracoke's sands are from shells that lived not in the depths of the ocean but most probably in the shallow sounds and coastal waters. Most beach shells are recent: remnants of meals from crabs and whelks. However, Garber is correct that black shells are typically fossils once buried beneath the migrating islands. The Spanish blood of the Ocracoke ponies may be very thin, but the legend is strong that these animals are pure descendants. I was not sure whether Garber wanted to leave us with an enhanced story or bare the less than romantic truth.

If you have ever walked a beach after a storm, you'll appreciate the spirit of Garber's writings. The dried sea horse she found in the strand line would lead anyone to ask curious questions about its lifestyle. She used another bit of flotsam, a starfish, to adorn her Christmas tree. This reflects that she is not a collector of the living animal just for its shell, but does admire and accept the gifts that the waves and winds bring to the island.

"Ocracoke Wild" is fun to read. Its seasonal divisions and short narrative chapters provide insight to the natural history of the Outer Banks. The writing style is like a personal diary. It is obvious that Garber loves the island and the sound and wants to do what she can to protect its integrity. Throughout the book, her message to the reader is that we share in this responsibility to protect the wildlife, marshes, beaches and quality of the natural island system. These are the real treasures.

The 166-page paperback book costs \$13.95. It is available in bookstores or from the publisher, Down Home Press, P.O. Box 4126, Asheboro, NC 27204, 910/672-6889 (phone), 910/672-2003 (fax). If ordering from the publisher, add \$2 for shipping. North Carolina residents also add 84 cents sales tax.

Give them
Coastwatch!
It's a present
that will
delight and
entertain
all year.

They'll
explore
each new
issue,
soaking
up the
adventure
and wonder
of coastal
North
Carolina.
And they'll
love you
for it!

See the attached gift cards for more information.

ame:		
Address:		-
City:	State:	Zip:
Coastwatch, Box 8605, N.C	vice. Please send check or money order to C. State University, Raleigh, NC 27695-8 ease allow 6-8 weeks for delivery on new sub-	605
Gift Subscrip		
\square 3 years/\$42 \square 2 year (A gift card will be sent to the r	s/\$28	0.)
For: Name:		
Address:		
	State :	
City: We do not have a billing ser Coastwatch, Box 8605, N.C (All orders must be prepaid. Pl		Zip: o: 605
City: We do not have a billing ser Coastwatch, Box 8605, N.C (All orders must be prepaid. Pl	State:State:State:State:State:State University, Raleigh, NC 27695-8ease allow 6-8 weeks for delivery on new sub-	Zip: o: 605
City: We do not have a billing ser Coastwatch, Box 8605, N.C (All orders must be prepaid. Pl	State: vice. Please send check or money order to the state University, Raleigh, NC 27695-8 ease allow 6-8 weeks for delivery on new substitution.	Zip: o: 605 oscriptions.)
City: We do not have a billing ser Coastwatch, Box 8605, N.C (All orders must be prepaid. Plane) Gift Subscrip 3 years/\$42	State: vice. Please send check or money order to the control of t	Zip: o: 605 oscriptions.)
City:	State: vice. Please send check or money order to C. State University, Raleigh, NC 27695-8 ease allow 6-8 weeks for delivery on new subsequences. State: 1 year/\$15 recipient if orders are received before Dec. 2	Zip: o: 605 oscriptions.)

(All orders must be prepaid. Please allow 6-8 weeks for delivery on new subscriptions.)

Give them

Coastwatch!

It's a present that will delight and entertain all year.

They'll
explore
each new
issue,
soaking
up the
adventure
and wonder
of coastal
North
Carolina.
And they'll
love you
for it!

See the attached gift cards for more information.

A Sea Grant Home Page

North Carolina Sea Grant has a home page on the Internet's World Wide Web. You can visit our page by typing the following URL: http://www2.ncsu.edu/ncsu/CIL/sea_grant/index.html. We have posted information about our program, staff, publications and *Coastwatch*.

You can use the home page to send us electronic mail, order publications, review the table of contents of the last six issues of *Coastwatch* and connect to other home pages in the Sea Grant network.

That's just the beginning. In coming months, we'll add an upcoming events section, a science section describing ongoing research and a news section for media. Eventually, we may also post some of our newsletters and other free publications.

Please visit our home page and comment to us about what you like and don't like. Tell us what you want to see added. And remember, the page will be evolving, so visit often.

Marine Debris Worldwide Goes Electronic

If you have a computer and access to the Internet, then you can read Sea Grant's latest newsletter — *Marine Debris Worldwide* — from your computer screen. The newsletter was begun this year to facilitate and formalize international communication about marine debris. It is funded by the National Marine Fisheries Service through a grant to North Carolina Sea Grant.

To access the *Marine Debris Worldwide* home page, type the following URL: http://www2.ncsu.edu/unity/lockers/project/marinedebris/index.html. After cruising through cyberspace to this page, you'll find the latest issue of the international newsletter.

Marine Debris Worldwide contains international information about marine debris impacts, sources, surveys, research, conferences, publications and solutions. The latest issue includes articles about marine debris issues in the United States, the Caribbean, New Zealand and Africa. One article recounts the amount of ocean debris seen by sailors participating in the BOC Challenge (an around-the-world sailboat race). Another describes a complex regional marine debris project launched by five countries in West Africa's Gulf of Guinea.

To read these articles and more, visit the *Marine Debris Worldwide* home page. The site will be updated quarterly when new issues are released. It also includes an introduction to marine debris issues.

If you don't have a computer but would like to receive the newsletter, write North Carolina Sea Grant. Ask for *Marine Debris Worldwide*. It's free.

We're All Cleaned Up

For the ninth consecutive year, volunteers flocked to North Carolina waterways to participate in the First Citizens Bank Big Sweep. In all, 12,489 volunteers devoted more than 49,000 hours to ridding our state's beaches, lakes, rivers and streams of unsightly, potentially deadly litter left by others.

Volunteers used every method imaginable to collect debris. They walked shorelines, waded through creeks, canoed down rivers and dived beneath ocean piers. When the bags of trash collected by this conscientious crew were tallied, volunteers had swept more than 168.5 tons of debris from 1,322 miles of state shoreline.

It was a feat to be proud of — one that left North Carolina's waterways cleaner and saved the state more than \$200,000 in cleanup costs.

"We were thrilled at the turnout," says Kathy Hart, chair of the board of

directors of N.C. Big Sweep and Sea Grant's communications director. "Trash totals were lower for the third consecutive year. We're making a difference and that makes everyone involved in Big Sweep very happy."

Participation was heaviest in Dare, New Hanover, Carteret, Guilford, Brunswick, Buncombe, Wake, Davidson and Ashe counties. Trash totals were greatest in New Hanover, Wake, Davidson and Dare counties.

Among the mundane and abundant litter — cigarette butts, glass bottles, plastic bags, plastic bottles and fishing line — was the unusual: four refrigerators, one washing machine and five television sets in Duplin County; a barbecue grill in Beaufort County; a grave marker in Cumberland County; a wheelchair in Guilford County; a bathtub in Pender County; and a cellular phone in New Hanover County. Volunteers found a little of everything, including the kitchen sink in Johnston County.

Plans are already under way for next year's cleanup — Big Sweep's 10th anniversary. It's scheduled for Sept. 21. To volunteer now, call 1-800-27-SWEEP.

N.C. Big Sweep is a public-private partnership led by a board of directors representing: First Citizens Bank; Carolina Power and Light; Duke Power Co.; Glass Packaging Institute; Keep America Beautiful of North Carolina: Keep America Beautiful of New Hanover County; Keep Wayne County Beautiful; N.C. Department of Environment, Health and Natural Resources: N.C. Division of Coastal Management; N.C. Sea Grant; Rowan County Parks and Recreation; R.J. Reynolds Tobacco Co.; Southeastern N.C. Waterman's Association: University of North Carolina at Charlotte: U.S. Power Squadrons; WGHPiedmont 8 TV; and Wilson County Office of Waste Reduction and Recycling.

NORTH CAROLINA SEA GRANT
NORTH CAROLINA STATE UNIVERSITY
BOX 8605
RALEIGH, NC 27695-8605 RETURN POSTAGE GUARANTEED 424 M7 P 621 05/14/07 451/18 **



STATE LIBRARY OF NORTH CAROLINA
3 3091 00767 5101

